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PREFACE.

In the preparation of this Treatise it has been the aim of the Authors to present a concise yet practical description of the diseases of the Nose, Throat, and Ear, with their appropriate treatment, bringing each subject up to the full knowledge of to-day. Rhinology, Laryngology, and Otology are so intimately associated, physiologically and pathologically, that a consideration of the various diseases which are so frequently co-related may very appropriately be arranged within the covers of a single volume.

New York, March, 1900.

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Diseases of the Nose and Throat.

THE NOSE.

ANATOMY.

The external nose is composed of integument, bones, cartilages, and muscles which serve to move the cartilages. The nasal bones, situated one on either side, occupy the space between the nasal processes of the superior maxillary, and, by their junction, form the bridge of the nose. Their anterior surfaces are subcutaneous, convex, and present the orifices of several small canals for the transmission of blood-vessels. Their posterior surfaces are concave, form part of the roof of the nose, and are each marked by a longitudinal groove for the passage of the external branch of the nasal nerve. Their superior borders are thick, serrated, and firmly articulated with the frontal bone. Their inferior borders are thin and sharp, and serve for the attachment of the lateral cartilages of the nose. The external borders are serrated and slightly bevelled to articulate with, and be supported by, the nasal processes of the superior maxillary. The internal borders articulate with each other, in the middle line, along the "nasal suture." From the under surface of this suture is projected a vertical crest of bone, which forms part of the septum of the nose. This crest articulates with the nasal spine of the frontal above and the perpendicular plate of the ethmoid below.

The internal nose is divided midway by the septum into two cavities, the

These nasal passages, two irregular cavities of wedge-like shape, open widely to the air in front through the nostrils. The posterior nares or *choanæ* are two oval openings, looking directly backwards into the nasopharynx. They are separated from each other by the posterior border of the vomer bone. The vertical diameter of each opening measures about one inch; the widest transverse diameter is about half an inch.

The roof is somewhat arched from before backward, is narrow, and is formed by the nasal bones, the nasal spine of the frontal, the cribriform plate of the ethmoid, the under surface of the body of the sphenoid bone and of the sphenoidal process of the palate bone.

The floor is nearly horizontal, and is formed by the palate bones and palatine processes of the superior maxillary bones. In the palatine suture, immediately behind the middle incisor teeth, on each side of the septum, is the orifice of the anterior palatine canal.

The inner wall, or septum, is a thin vertical plate consisting partly of bone and cartilage, which separates the nasal fossæ from one another. Its surface is marked by numerous vascular and nervous canals, and the groove for the naso-palatine nerve. The lower portion of the cartilaginous septum consists of two laminæ, which, as a rule, unite, but may remain bi-laminar. The bones entering into its formation are the vomer, the perpendicular plate of the ethmoid, the nasal spine of the frontal, the crests of the nasal, superior maxillary and palate bones; also the crest of the sphenoid.

The outer wall is formed by the nasal process of the superior maxillary and lachrymal bones; by the ethmoid and inner surface of the superior maxillary and inferior turbinated bones; by the vertical plate of the palate bone, and the internal pterygoid plate of the sphenoid.

Each nasal fossa communicates with four sinuses: the frontal above, the sphenoidal behind, and the maxillary and ethmoidal on either side. Each fossa also communicates with four cavities: with the orbit by the lachrymal canal; with the mouth by the anterior palatine canal; with the cranium by the olfactory foramina, and with the spheno-maxillary fossa by the spheno-palatine foramen.

The cartilaginous framework consists of five pieces: the two upper lateral, and the two lateral cartilages, and the cartilage of the septum.

The upper lateral cartilage is flattened and triangular in shape, its posterior border being continuous with the nasal bone and the nasal process of the superior maxillary bone, its anterior border being separated from that of its fellow of the opposite side by the edge of the septum.

The lower lateral cartilage (the cartilage of the aperture) is curved in such a manner as to form the inner and outer walls of each orifice of the nostril. It has no bony attachment, being imbedded in the dense cellular tissue of the ala nasi, in which there are frequently two or three little additional nodules —sesamoid cartilages. The cartilages of the two sides adjoin at the tip of the nose, and are attached to the upper lateral cartilages by fibrous tissue.

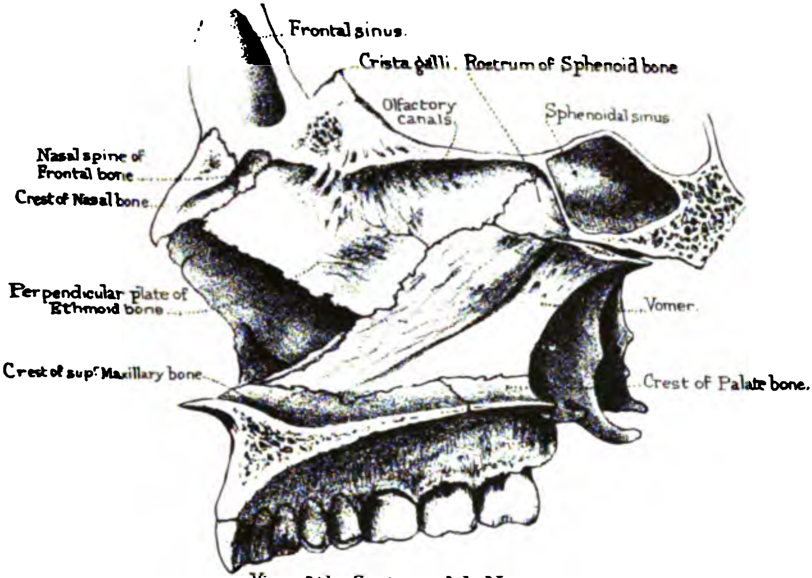
The cartilage of the septum is quadrilateral in shape, and fits into the interval between the vertical plate of the ethmoid and the vomer, completing the separation between the nasal fossa in front. It lies in the median line until about the seventh year, when there is usually a slight deviation to one or other side.

These various cartilages are connected to each other, and to the bones, by a tough fibrous membrane, the perichondrium, which allows the utmost facility of movement between them, and serves to support the nutrient blood-vessels of the cartilage.

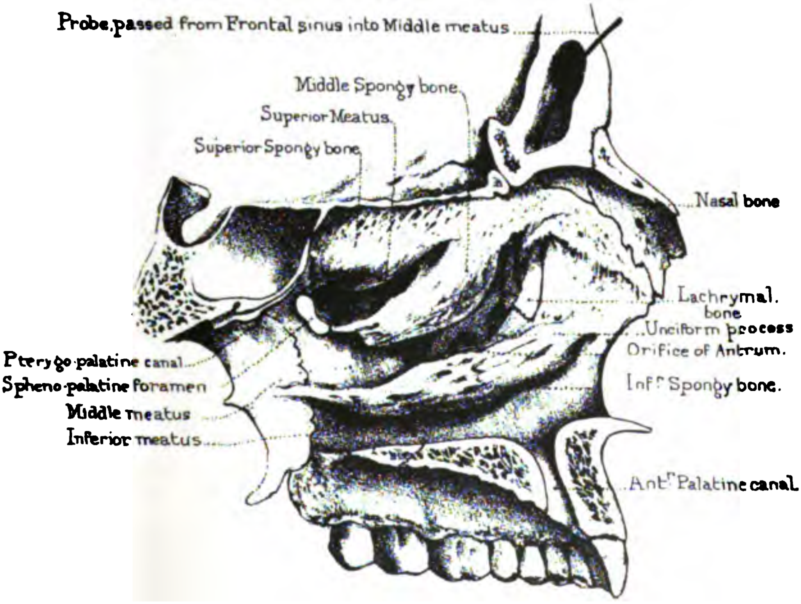
In each nasal cavity there are three spongy or turbinated bones (so called from their curved form), an upper, a middle, and a lower. The superior and middle turbinated bones are processes of the ethmoid bone. The superior is smallest, is the least scroll-shaped of the three, and does not reach as far forward as the middle bone. Anteriorly it is united with the middle turbinated bone; posteriorly it is entirely separate from it. In some cases there is a horizontal slit in the posterior portion of the superior turbinated bone, which forms a fourth turbinal. The middle turbinated bone is more rolled round at its centre than at its extremities, and is curved upon itself in the same manner as the inferior turbinated bone. Below the middle turbinated bone is a deep furrow, the *hiatus semilunaris*, which is crescentric in shape, and has a downward and backward direction, the convexity looking forward. There is a small projection near its anterior free end—the *agger nasi*—which is directed inwards; on the septum, at a corresponding level, there is a slight bulge. These two minute protuberances make a faint line of demarcation between the olfactory and respiratory regions The inferior turbinated bone, the longest of the three, is an elongated scroll of bone attached by its upper edge along the outer wall of the nose. It is the most compact in structure, and the only one of the three which is an independent bone.

The spaces between these bones are called respectively the superior, middle, and inferior meatus. Beneath the superior turbinated bone lies the superior meatus, into which open the posterior ethmoidal cells and the sphenoidal cells. At the back of this meatus is the spheno-palatine foramen, which leads into the spheno-maxillary fossa. Below the middle turbinated bone is the middle meatus, which communicates above with the anterior ethmoidal cells; on its outer wall, through the *hiatus semilunaris*, or ethmoidal fissure, it leads to a funnel-shaped cavity—the infundibulum—which communicates at its upper and anterior part with the frontal cells, and at its lower and posterior part by the *ostium maxillare* with the antrum of Highmore. Below the inferior turbinated bone is the inferior meatus. No air-cells open into this meatus; there is only the termination of the nasal duct or channel which conveys the superfluous secretions from the eye.

The maxillary sinus, or Antrum of Highmore, is the largest of the air-cells in the bones of the head. The anterior wall of this cavity looks towards the cheek; the posterior wall is convex, and bulges into the zygomatic fossa; the superior wall or roof of the antrum slopes downwards and outwards, and forms the floor of the orbit; the internal wall looks toward the nose. It is lined by nasal mucous membrane. It varies in size and somewhat in shape in different persons, but as a rule it has the form of a triangu-



View of the Septum of the Nose.



View of the three "Meatus" of the Nose.

lar pyramid, with the base towards the nose and the apex towards the malar bone. The nasal opening into the antrum is in the middle meatus.

The frontal cells or sinuses are two prism-shaped cavities over the root of the nose, divided in the mesial line by a thick bony septum; they lie between the two tables of the frontal bone. They communicate freely with each nostril through the infundibulum, and are lined with a continuation of the nasal mucous membrane. They are not developed till towards the age of puberty, and progressively increase in size afterwards. Their use is not only to lighten the skull, but to help the resonance of the voice.

The sphenoidal cells or sinuses are two air-cavities in the body of the sphenoid bone, and are separated by a perpendicular partition. They are not developed in young persons, but in the adult they gradually become large enough to excavate the whole body of the bone. Air is admitted freely into them from the superior meatus of the nose through an opening in the front wall of each sinus, and they are lined with a prolongation from the nasal mucous membrane.

The ethmoidal air-cells are made up of irregular cavities in the lateral portion of the ethmoid bone; they are surrounded by paper-like walls of bone lined by the nasal mucous membrane. The cells are divided into an anterior and posterior set, and the cells of one set do not communicate with those of the other. The superior meatus leads into the posterior ethmoidal cells. The middle meatus leads into the anterior ethmoidal cells, and also to the frontal cells through the infundibulum, which traverses the foremost of the ethmoidal.

The mucous membrane of the nasal cavities is continuous in front with the skin of the nostrils, and posteriorly with the mucous membrane of the pharynx. That of the external nostril (the vestibule) is lined with stratified squamous epithelium. That which covers the olfactory region, embracing the upper half of the middle turbinal, upper third of the septum, and the superior turbinal is thin and closely adherent to the periosteum; it is moderately supplied with glands, which are serous in variety; it is very vascular; its yellowish color is due to the pigment in the epithelium and the glands. The epithelium is of the columnar variety, but is destitute of cilia. Lying between these columnar cells are delicate rod-shaped bodies, each with a spherical nucleus, known as the olfactory cells of Schultze. Destruction of these cells results in abolition of the sense of smell. The mucous membrane which covers the respiratory region and the accessory sinuses is termed the Schneiderian, or pituitary, membrane. It differs in structure in different localities, that which covers the internal surface of the turbinated bodies and the accessory sinuses being quite thin, while in the nasal fossæ proper the membrane is thicker.

In the anterior nares strong hairs are to be found, known as vibrissæ, designed to prevent, to a certain extent, the entrance of floating dust and coarse particles. The mucous membrane of the septum has numerous albuminous and mucous glands freely distributed over its entire surface. The epithelial layer of the mucous membrane of the nasal cavity proper is of the columnar variety, and ciliated. The cilia or hair-like projections have a vibratory action, and are directed posteriorly, toward the pharynx. The mucous membrane in the nasal fossæ is quite thick, and is richly supplied with mucous and serous glands, the latter being larger and far more numerous than the former. The thickness of the mucous membrane is due not only to these glands, but more particularly to the existence in it of true erectile tissue. This erectile tissue is most abundant over the inferior and middle turbinals and the lower part of the septum.

The arterial supply of the nasal fossæ is derived from the anterior and posterior ethmoidal, from the ophthalmic, which supply the ethmoidal cells, frontal sinuses, and roof of the nose; the spheno-palatine branch of the internal maxillary supplies the mucous membrane covering the turbinals, the meatuses, and septum; and the alveolar branch of the internal maxillary, which supplies the lining membrane of the antrum. The ascending pharyngeal from the external carotid, besides the terminal branches of the spheno-palatine and the vidian, supply the chief portion of the posterior nasal cavity.

The veins of the nasal fossæ form a close network beneath the mucous membrane. Some of the veins accompany the spheno-palatine artery through the spheno-palatine foramen; others, through the alveolar branch, join the facial vein; some accompany the ethmoidal arteries, and terminate in the ophthalmic vein; and a few communicate with the veins in the interior of the skull through the foramina in the cribriform plate of the ethmoid bone, and the foramen cæcum. The ramifications of these vessels form a close, plexiform network beneath and in the substance of the mucous membrane.

The nerves of general sensation are: the nasal branch of the ophthalmic, which ramifies on the upper and anterior part of the septum, and the upper portion of the outer wall; the naso-palatine nerve supplies the middle part of the septum; the spheno-palatine branch of the second division of the fifth nerve, and the vidian nerve, supplies the membrane at the back part of the roof of the nose and septum, and that covering the end of the Eustachian tube; the anterior palatine nerve ramifies over the middle meatus, and the middle and inferior spongy bones. The special nerve of the sense of smell, the first, or olfactory nerve, a portion of the cerebral substance, gives off numerous filaments, which, after passing through the foramina in the cribriform plate of the ethmoid, are distributed to the mucous membrane over the upper third of the septum, the roof of the nose, the superior and middle turbinated bones, and the surface of the ethmoid in front of them.

THE NASOPHARYNX.

The posterior nasal space is continuous anteriorly with the nasal cavities; laterally it communicates with the middle ear by means of the Eustachian tube; its roof or vault lies immediately below the skull, is quadrilateral with rounded edges, and in form is a half dome; the posterior wall is almost vertical, and lies in front of the pharyngeal fascia, the anterior arch of the atlas, and the body of the axis. Its floor is the upper border of the soft palate, which is continuous posteriorly with the floor of the nose.

The mucous membrane, pale rose in color, is continuous with all the openings into it, and is adherent to the underlying tissues. Its epithelium is cylindrical and ciliated. The mucous membrane is bountifully supplied with conglomerate and follicular glands, the former being most abundant on the posterior and lateral aspects of the upper part of the pharyngeal wall. They gradually diminish in number as they are followed downwards, and opposite the isthmus faucium they are separated from each other by considerable intervals. The follicular glands are similar in character to those which are observed on the root of the tongue, and to those which constitute the faucial tonsils. In the same localities they occur in an isolated condition, in others they are collected together in masses of different sizes. On the upper part of the posterior pharyngeal wall, near the vault, is an aggregation of considerable size, which Luschka has termed the "pharyngeal tonsil."

The fossa of Rosenmüller, or *recessus pharyngeus*, is a depression between the orifice of the Eustachian tube and the posterior wall of the pharynx. The opening of the cartilaginous portion of the Eustachian tube lies on the level of the posterior nares, and about three and one-fifth inches from the anterior nares.

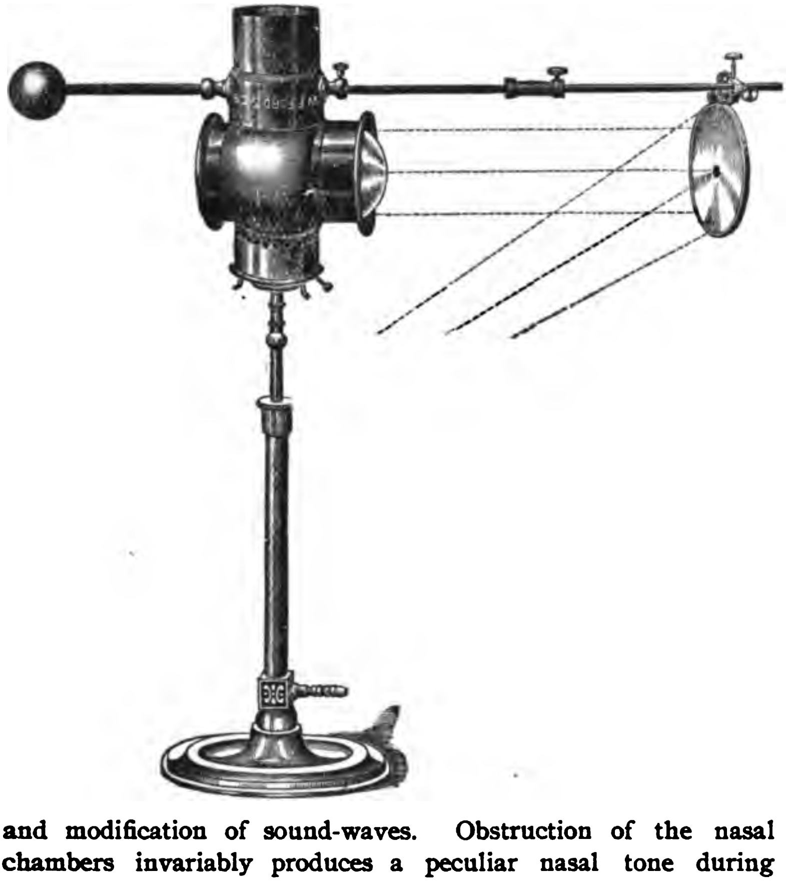
PHYSIOLOGY.

The physiological functions of the nose are four-fold:

First.—RESPIRATION. The most important function of the nose is to filter, warm, and moisten the inspired air. The peculiar arrangement of the vascular supply of the turbinated tissues, in addition to the glandular supply of the nasal cavities, in health, is all-sufficient for accomplishing this function. The normal nasal mucous membrane is provided, by transudation of serum through the walls of the capillary canals, with a sufficient amount of moisture for all respiratory necessities. The more watery portion saturates the inspired air with moisture; the moist condition of the mucous membrane serves to detain particles of dust in the inspired air.

Second.—OLFACTION. Substances endowed with odorous properties give off material emanations, which must come in contact with the olfactory membrane, and be dissolved in the secretion covering it, before their pecular odor is appreciated. The nerve filaments given off from the olfactory bulb are the special agents for communicating impressions of smell, and they are the only ones endowed with olfactory sensibility.

Third.—Resonator to the Voice. The nasal cavities serve as resonant chambers for the perfection, amplification, and modification of sound-waves. Obstruction of the nasal chambers invariably produces a peculiar nasal tone during speech.

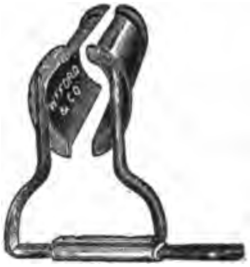


Fourth.—Audition. If the nasal passages are unobstructed, the acts of breathing, gaping, swallowing, etc., all aid in properly ventilating the middle ear—that is, in restoring the equilibrium between the internal and external atmospheric pressures, which is so essential to perfect hearing.

RHINOSCOPY.

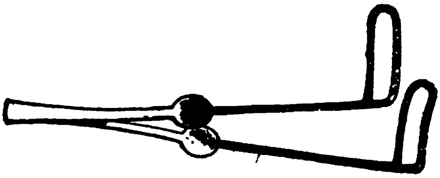
The demonstration of a practical method of examination of the larynx was first made by Manuel Garcia, in 1854; but to Czermak belongs the credit of having created the art of laryngoscopy and rhinoscopy, in 1858. Since that date the valuable additions to our knowledge of the diagnosis and treatment of diseases of the throat and nose have been remarkable.

The source of light may be either sunlight or artificial; the latter is preferable, and may be furnished by lamp, gas, or electricity. Reflected light is now almost universally employed. Illumination of these parts is best secured by the attachment of a Mackenzie condenser over an ordinary Argand gas-burner, or to a student lamp, and from this reflected into the patient's nose or throat by means of a concave mirror, about four inches in diameter, with a central perforation. The mirror may be fastened either to the condenser, or worn upon the forehead by means of a head-band. The patient should be seated directly opposite the observer, the light being placed at about the level of the patient's ear and a trifle behind it.

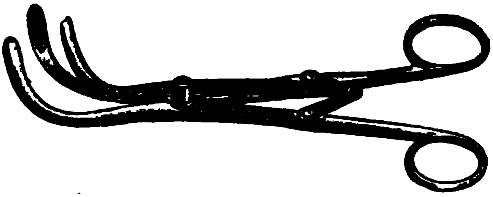


Myles' Nasal Speculum.

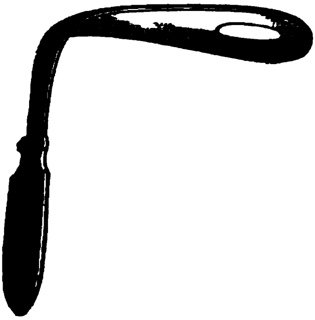
Anterior Rhinoscopy is easily effected if adequate illumination be obtained and the nostrils properly dilated. The kind of speculum to be employed is optional, the more simple the better, the prerequisite being that care should be exercised in its use, as severe pain is sometimes caused by sudden expansion of the nostril. Inspection of the nasal fossa will reveal the inferior and middle turbinated bones, the septum, the floor and roof. Sometimes the superior turbinate bone may be seen where there is marked septal deflection, or where atrophy of the lining membrane has occurred the entire nasal cavity back to the pharynx may be viewed. The mucous membrane of the inferior turbinate bone and the floor is usually bright



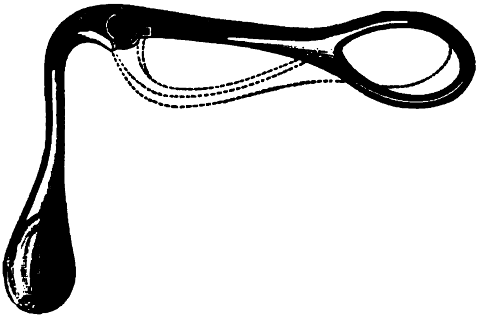
Bosworth's Nasal Speculum.



Elsberg's Nasal Speculum.



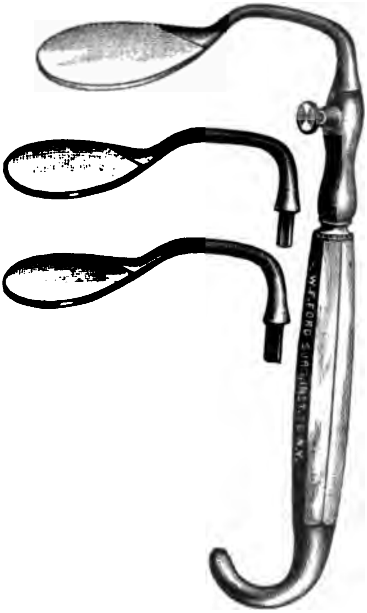
Bosworth's Tongue Depressor.



Goodwillie's Tongue Depressor.

red, while that over the middle turbinated and the septum is somewhat paler. The color may be dependent upon the character of light employed (natural or artificial), as well as the condition of the blood of the patient.

Posterior Rhinoscopy. In examining the posterior nares the patient's head should be thrown slightly backward, the mouth being open, with tongue depressed; the light from the head-mirror is focused upon the pharynx. The rhinoscopic mirror (No. 1 in size) having been warmed to about 100° by holding the glass surface over the light for a moment is carefully passed backward to the soft palate, behind which it should be gently placed, being careful not to provoke irritation by contact with parts adjacent. Considerable difficulty may be experienced in making these examinations, but perseverance and patient practice will overcome the obstacles which may present. The anatomy of the region to be inspected should be thoroughly understood, or the recognition of the different



Türck's Tongue Depressor.

parts will be very confusing to the beginner. With the vomer as the starting point, the following may be made to pass in review:—the three turbinated bones, the meati, the Eustachian orifice, the fossa of Rosenmüller, the vault of the pharynx and posterior surface of the velum.

ACUTE RHINITIS.

(SYNONYMS: *Coryza; Acute Nasal Catarrh; Cold in the Head.*)

Simple Rhinitis is an acute catarrhal inflammatian of the nasal mucous membrane, with an involvement of the turbinated bodies. The respiratory portion of the nasal passages, with the peculiar qualities of the turbinated bodies and its bountiful blood and glandular supply, is unremittingly subjected to the variations of atmospheric conditions of heat and cold, dryness and moisture. This sensitive area promptly responds to all stimuli, whether mechanical, chemical, or thermal, the effect being manifested, in proportion to the nature and duration of the stimulus, by congestion and swelling of the erectile structures and an increased secretion. The activity of the inflammatory process in this region is remarkable for the copiousness of the serous exosmosis as well as mucous secretion.

Predisposing Causes:—Children are particularly liable to coryza, chiefly those who are ill-nourished and who manifest a tendency to glandular enlargements. Persons of the rheumatic and neurotic diatheses are subject to frequent attacks of rhinitis.

Exciting Causes:—Rhinitis is very frequently caused by sudden exposure to cold (the word *cold* being applied to the production of acute inflammatory conditions of the respiratory apparatus); sudden atmospheric changes; cold, wet feet; blows; shocks; drugs—such as iodine, iodide of potash, bichromate of potash, arsenic, mercury, various acids, irritating vapors, and solid particles suspended in the atmosphere. Extreme heat sometimes causes catarrhal conditions in the neurotic subject. Rhinitis is a frequent concomitant of the exanthemata—measles, small-pox, scarlet fever. Some cases appear to be transmissible, and hence presumably are the result of the action of a *contagium vivum.*

In the first stage there is an intense hyperæmia, with arrest of secretion—the mucous membrane is abnormally dry; the second stage is designated by swelling of the membrane and profuse watery secretion, which is exceedingly irritating; in the third stage the epithelium is detached and a large number of new cells are produced; the serous secretion is overloaded with mucus and pus cells, shed epithelium and molecular débris, and it is converted into a muco-purulent discharge, having lost its irritating quality; finally the discharge disappears in the inverse ratio of its appearance. An attack lasts from two to seven days, usually terminating in recovery, but it may pass into a subacute or chronic form.

The first symptoms are general malaise with chilly sensations, followed by fever, bone pains, and anorexia. The local manifestations are announced by a feeling of fullness at the bridge of the nose, and a dry, stuffy, uncomfortable feeling in the nares, with an inclination to sneeze. The temporary arrest of secretion is soon followed by hypersecretion, the anterior nares are inflamed and excoriated, and sneezing is more frequent. In some cases there is considerable fever alternating with chilliness. The swollen mucous membrane causes a peculiar nasal intonation, and the catarrhal condition of the conjunctiva, nasal duct, and Eustachian tube results in lachrymation and deafness. If the accessory cavities are involved in the inflammatory process the frontal headache will be unusually severe, and if the antrum of Highmore be implicated there will be severe pain in the cheek.

Anterior rhinoscopic examination will disclose the bright pinkish-red and swollen condition of the mucous membrane, which occasions the occlusion and anosmia. Posterior rhinoscopic examination will show the posterior extremities of the turbinated bodies to be swollen and deep red in color, if not obscured with mucus, and in young persons the pharyngeal tonsil will be enlarged.

Preventive treatment includes the avoidance of the known causes of the disease, the wearing of suitable underclothing (woolen, not too heavy), and shoes with heavy soles. The daily use of the cold bath when practicable, or the cold sponge, should be urged, to stimulate the circulation and tone the general nervous system. Abnormal conditions of the nasal cavities, such as deviations of, or outgrowths from, the nasal septum, hypertrophied turbinals, adenoid growths, etc., produce a liability to attacks of rhinitis or render the attacks more intractable to treatment. Obviously these conditions must be removed.

A great many remedies have been recommended to arrest an attack of acute rhinitis, and the result depends mainly on the promptness with which the remedy has been applied. Acute rhinitis may be greatly mitigated by exciting free diaphoresis in the early stage. This may be accomplished by means of the Turkish baths, or hot drinks, a mustard foot-bath, and additional bedclothes will assist the general result. Rest in bed for the first day or two of the attack is the most effectual method of treatment.

The topical application of a four per cent. solution of hydrochlorate of cocaine will afford relief, but it is a remedy that should be carefully employed *only* by the physician. It causes vascular contraction when applied to the mucous membrane; its action is temporary and turgescence soon returns. Menthol, alone or in combination, has been advantageously employed. Sprays, snuffs, etc., are palliative; the *cure* lies with the administration of the indicated remedy.

Aconitum is useful in first stage, when chilliness is present, with rapidly rising fever.

Camphor in first stage, when the nose feels stuffed and the inspired air feels cold; the patient feels chilly.

Gelsemium.—Fullness of head; chills run up and down the back; desire to hug the fire; watery, excoriating discharge from nose, and sneezing; a predisposition to take cold from any change in the weather, especially if it be warm and relaxing.

Arsenicum album has a thin, watery, excoriating discharge, yet the nose feels stopped up; frontal headache and photophobia; great sneezing which does not relieve.

Arsenicum iodatum has an abundant *thin*, *hot*, *excoriating* discharge from the nose, with *burning* sensation; lassitude and prostration.

Mercurius solubilis has a thin mucous discharge—not watery—though very excoriating.

Allium cepa.—Excoriating discharge from the nose, while that from the eyes is bland.

Euphrasia.—Suffusion of eyes, and excoriating discharge from the eyes; discharge from nose is bland; aversion to light.

Kali iodatum.—Most violent coryza, and pain in frontal sinuses. Nose red and swollen; discharge is acrid and watery.

Dulcamara is a prophylactic against dampness. Catarrhal troubles in cold, wet weather.

Hydrastis.—Watery, excoriating discharge, more profuse out of doors, with burning and rawness in the nose; sensation as of a hair in the nose.

Sanguinaria canadensis.—Fluent, excoriating discharge, with burning and rawness in the nose.

Chamomilla.—The nose is stopped up, yet a watery mucus is discharged; sneezing, and an inability to sleep.

Arum triphyllum.—Violent coryza; fluent, acrid discharge; nostrils very sore, with constant desire to pick the nose, which feels completely obstructed.

Belladonna.—Acute rhinitis; nose swollen, red and hot; offensive smell in nose; frequent sneezing; epistaxis.

Nux vomica.—Rhinitis caused by dry cold weather; nose feels dry and obstructed, or there is sometimes a watery and acrid discharge, aggravated when indoors, relieved in open air.

ACUTE RHINITIS IN INFANTS is a common affection during the first two months of existence. It is commonly known as the "snuffles." The discharge from the nostrils, though scanty at first, afterwards becomes abundant, sometimes acrid and even muco-purulent, dries and forms a crust about the nostril which interferes with the child's respiration through the nose. The formation of the crusts is best prevented by applications of some animal oil, and enjoining upon the nurse the necessity of great cleanliness. If the nasal obstruction is complete, which is rarely the case, the child must be fed with a spoon.

Consult **Chamomilla, Nux vomica, Sambucus nigra, Sticta pulmonaria.**

The majority of the pathological conditions in the nose which occur in later life are undoubtedly the results of acute and chronic muco-purulent and purulent rhinitis in children. A "cold in the head" is too often regarded as a transient affection, and the necessity of breathing through the nose has not received its full share of attention.

New-born infants sometimes suffer from a purulent discharge from the nose; it is usually supposed to result from infection with leucorrhœal discharge, or from gonorrhœal matter. When a similar condition has developed in the adult it is caused by direct infection of the nasal mucous membrane through carelessness of habit. The conjunctiva may be simultaneously infected.

The nose should be kept as clean as possible by using a tepid alkaline spray of Sodæ bicarbonate, twenty grains to the ounce of water. Afterwards the nasal cavities should be sprayed with a solution of alum, five grains to the ounce.

When there is difficulty of sucking from stoppage of the nose, the infant must be fed with a spoon, or through a short œsophageal tube.

Consult **Aconite, Belladonna, Dulcamara, Hepar sulphuris, Mercurius solubilis.**

FIBRINOUS OR CROUPOUS RHINITIS.

(MEMBRANOUS RHINITIS.)

Fibrinous rhinitis sometimes occurs as the result of an acute rhinitis in which there is an intensified inflammatory action, and is manifested in certain individuals who are peculiarly predisposed to such a development. Insanitary surroundings and climatic circumstances are contributing etiological factors. An identical condition occurs when a fibrinous membrane develops as the result of an intense inflammatory action subsequent to electric or other cauterization of the nasal mucous membrane.

The fibrinous exudate which forms upon the surface of the mucous membrane is of a whitish-gray or yellowish color, and resembles very closely a diphtheritic membrane, from which it differs, in that it is usually not so closely adherent, and may be removed without producing any hemorrhage or abrasion of the surface.

In idiopathic fibrinous rhinitis the exudate may be confined to the nares, or it may be limited to the nasopharynx and pharynx. There is a great tendency to regeneration of these patches in from twenty-four to forty-eight hours after removal, but they indicate no liability to involve other regions or to extend their own dimensions.

The subjective symptoms are generally those of a severe rhinitis. There is a moderate fever, more or less occlusion of one or both nasal passages, with a profuse sero-mucous discharge, which later may become muco-purulent or purulent, but not fetid. Pieces of membrane are occasionally extruded with the secretions.

Diagnosis.—At the outset it may be difficult to differentiate simple fibrinous rhinitis from nasal diphtheria, but the absence of pronounced constitutional depression and the test of a bacteriological examination will remove doubt. In membranous rhinitis the neighboring glands are not enlarged, and the Klebs-Lœffler bacillus is absent. The duration of the affection varies from one to three weeks, but occasionally it runs a chronic course.

The **treatment** consists in washing out the nostrils with a tepid solution of dilute lime water, or formula 3, after which the membrane should be gently removed by means of forceps. After removal of the pseudo-membrane the parts should be covered with a little iodol or aristol, by insufflation.

Consult **Hepar sulphuris, Kali bichromicum, Mercurius solubilis.**

Echinacea angustifolia.—Ichorous, foul-smelling discharge from the nose, making the lips sore. Membranous formations protruding from the nose.

SIMPLE CHRONIC RHINITIS.

(SYNONYMS: *Rhinitis Chronica; Chronic Nasal Catarrh; Chronic Coryza.*)

Simple chronic rhinitis is most commonly caused by a succession of acute attacks, and neglect of proper attention in their treatment. Chronic rhinitis is frequently met with in those persons whose occupations expose them to the prolonged inhalation of dusty or irritating atmosphere, as weavers, millers, furriers, workers in tobacco, etc. Deviations of, and outgrowths from, the septum, and polypi, by obstructing the current of air and preventing the removal of the secretions, contribute greatly to the development of this affection. It is found in persons of all ages, but is very common in children, especially when associated with adenoid vegetations in the nasopharynx. The most obstinate cases are found in those of the strumous diathesis, and the catarrhal condition which accompanies the exanthemata is especially liable to pass into a chronic rhinitis. It may be induced by any of the various causes enumerated under Acute Rhinitis.

Some old people have a discharge of limpid mucus from the nose without any inflammatory symptoms—*Rhinorrhœa*—due, undoubtedly, to a relaxed condition of the membrane and a paretic state of the local blood-vessels. In rhinorrhœa the discharge may be caused by a polypus in the antrum.

The ordinary inflammatory conditions of chronic rhinitis are responsible for the tumefaction of the erectile tissue covering the inferior turbinated body and the lower portion of the septum. This intumescent form of rhinitis is of common occurrence where there is an unusual narrowness of the bony framework of the nasal fossæ. The turgescence of the erectile tissue is caused by increased arterial blood-supply, which causes not only excessive dilatation of the venous sinuses, but gives sufficient pressure to the blood in them to overcome the elasticity of the tissue. This tumefied condition of the mucous membrane is more or less intermittent in character. It may involve both cavities at once, and may completely occlude the inferior meatus; when the patient is lying down the obstruction is most noticeable in the undermost nostril. The surface of these vascular swellings on the anterior and posterior ends of the inferior turbinated body will be seen to be smooth, uniform and globular, of a dark red or purplish color; it pits readily on pressure with a probe, the indentations being quickly obliterated; it fluctuates as if it were a sac but partially filled with fluid, and, if cocaine be applied, there will be a rapid subsidence of the swelling.

In simple chronic rhinitis there is an apparent increase of secretion, which is discharged mainly from the anterior nares, and partly into the nasopharynx. This discharge may be thin and watery; sometimes it is a thick tenacious mucus. A mucopurulent or even a purulent discharge occurs in children as a complication of adenoid vegetations, and as a sequel of the exanthemata. Headache in the frontal region, with a feeling of weight over the bridge of the nose, is common when there is enlargement of the middle turbinated body, due to inflammatory obstruction of the infundibulum. Sometimes the lachrymal duct is occluded. The Eustachian tubes are often involved, causing tinnitus aurium and possibly inflammation of the middle ear. Very frequently the sense of smell is lost, and the sense of taste is impaired. There is a more or less constant feeling of fullness and stuffiness, with inability to breathe except through the mouth, which causes the dry throat, alteration of the voice, and the various troubles dependent on nasal obstruction. The obstruction which occurs from distension of the cavernous tissue becomes a marked symptom in proportion to the amount of hyperplastic thickening. The swelling is liable to variations, being increased in damp weather. Hot, stinging, itching sensations in the nose and upper pharynx are common, while sneezing occurs on the slightest provocation. The tip and alæ of the nose may be pinkish or quite red, and sometimes a dry, eczematous condition of the skin around the anterior nares is present.

On examination the mucous membrane will generally be found reddened, of succulent consistency, the surface moist, and a considerable amount of secretion collected on the floor of the nasal fossæ. There is an increased discharge of mucus or muco-pus, and, in neglected cases, on the anterior part of the septum and inferior turbinal will be found flakes of dried mucus, which, if allowed to remain, will acquire an offensive odor. Abrasion of the membrane covering the cartilaginous septum just inside the nose will ensue from the accumulation of these adhesive crusts, which produce irritation by heat and tingling, prompting the patient to remove the scabs with the finger, resulting ultimately in ulceration and perforation of the septum. These collections of tenacious mucus are found also adhering to the surface of the nasopharynx and pharynx, and are removed from time to time by the act of hawking.

Subjects of chronic rhinitis are very liable to acute or subacute attacks. The constant irritation of the mucous membrane will produce hyperæmia, with consequent hypernutrition, which in time develops into true hypertrophy and polypoid growths. It is urgent, therefore, that a cure be effected as soon as possible, especially in children.

The morbid changes in the mucous membrane are caused by the repeated distension of the vessels, the loss of their contractile power, and their consequent permanent distension. The presence of an excess of white blood-corpuscles which crowd into the sub-epithelial connective layer induces the thickening and induration of the membrane; while the migration of other white blood-corpuscles through the coats of the vessels, having been transformed into pus cells, together with the glandular secretion, form the muco-purulent discharge.

Diagnosis.—This affection is to be distinguished from hay fever and from true hypertrophy. In chronic rhinitis and hay fever there will be found hyperæsthetic areas on the nasal mucous membrane, but in the latter disease hypertrophic or atrophic changes are not so common as in the former. Hay fever occurs at certain periods of the year, and recurs season after season; chronic rhinitis occurs at any time, is apt to be continuous, with frequent exacerbations. The swelling of the anterior end of the inferior turbinated body can be distinguished from true hypertrophy, and proved to be due to simple turgescence of the vessels by its collapsing under probe pressure and its prompt contraction on applying cocaine.

The **prognosis** is favorable if the case be properly treated and the irritating cause is removed. Without treatment chronic rhinitis may continue indefinitely, and finally cause hypertrophic changes in the nasal mucous membranes.

The **treatment** will depend on the nature and cause of the trouble in each individual case. Attention to the general health is the primal necessity. Catarrhal conditions of the respiratory tract in general are invariably associated with gastric and intestinal disorders, and whether or not the one is the cause of the other the recognition of their interdependence is a necessity in the proper treatment of chronic rhinitis, which too often is regarded as simply a local affection. Simple diet and less in quantity than usual; the daily use of the cold sponge and massage; moderate exercise in the clear open air, and the administration of the indicated remedy will be attended with permanent benefit. All influences which tend to aggravate the disease must be avoided. The avoidance of dusty and contaminated atmospheres, late hours, tobacco and alcohol, will aid in securing a successful result. Forcible blowing of the nose occasions an increased flow of blood to the part, causing increased secretion. Adenoid vegetations in the nasopharynx, septal deviations and outgrowths, and other abnormal conditions in the nasal passages, to which rhinitis is merely secondary, must be removed. In obstinate cases change of residence to a warm, dry, and equable climate may be necessary.

When there is persistent vascular swelling of the inferior turbinated body, due to hyperplastic thickening, it will be necessary to have recourse to some method of cauterization of this tissue so as to restore the free patency of the nasal passages. These methods will be considered under Hypertrophic Rhinitis.

In simple chronic rhinitis local applications not only afford considerable relief, but facilitate a cure. The nasal passages should be systematically cleansed, once or twice daily, by means of Sass's spray tubes or the atomizer, employing solutions of either formulæ 1 or 2. If the secretions are thin and watery, cleansing is obviously unnecessary. In such cases the use of astringents is most efficacious. A word of caution as to the excessive use of sprays may be necessary. If used too frequently they finally produce a relaxed condition of the parts, and rather tend to prolong the diseased action than to be curative. In some cases of advanced chronic rhinitis, when the secretion is very adherent, it is preferable to employ the post-nasal syringe, as the anterior spray can not be used long enough, on account of the intolerance to the patient's pharynx, to render it entirely satisfactory. After the cleansing an application may be made to the nasal cavity of solutions, such as formulæ 4 or 5. When the disease has existed for a considerable length of time, and the treatment as above indicated does not produce a sufficient astringent effect in absorbing the new products and restoring tone to the vessels, a spray of formula 6 will achieve a beneficial change in cases which have strenuously resisted other treatment.

Ammonium muriaticum.—Stoppage of one nostril during the day and both at night; the discharge is scalding, and the burning extends from the pharynx to the trachea.

Bromium.—Coryza, with profuse watery discharge, and soreness of the nose; ulcers, crusts, and bloody scabs form in the nose.

Hydrastis, **Kali bichromicum** and **Pulsatilla** have thick mucous discharge from the nose. With Kali bichromicum the mucus is more tenacious and stringy, and the ulcerative process is deeper than under Hydrastis. Pulsatilla discharge is not excoriating; the blandness of the secretion is characteristic.

Consult **Elaps, Kali iodatum, Mercurius solubilis, Teucrium.**

HYPERTROPHIC RHINITIS.

(SYNONYMS: *Hypertrophy of the Turbinated Bones; Hypertrophic Nasal Catarrh.*)

When chronic catarrhal rhinitis has continued for any considerable length of time certain changes take place leading to a general swelling and proliferation of the normal constituents of the mucous membrane and of the turbinated bodies, becoming permanently hypertrophied. It is the result of over-exercise of the glandular elements attendant upon repeated erections of the turbinal tissue, associated with frequently recurring attacks of acute rhinitis. Besides repeated congestions from cold, and irritation by dust, wind, and chemical agencies, there is potent evidence that undue and frequent sexual excitement is a direct cause of this form of nasal disturbance.

The inferior turbinated body is enlarged more frequently, and to a greater extent, than the middle turbinated, being most marked at its anterior portion, where the slit between the inferior turbinal and the septum is seen to be very narrow or obliterated by actual contact of the parts, the hypertrophied tissue assuming the pale, deeply-segmented cauliflower appearance. When the hypertrophy affects the posterior portion of the inferior turbinated body, the swollen tissue presents an uneven, lobulated, or mulberry-like appearance, blocking up the lower half of the choanæ. It is freely movable upon its attachment, although it can hardly be described as pedunculated. There are two varieties of these growths—the dark red or purple, and the white. The red variety is soft to the touch and bleeds easily. The protrusion of this mass into the nasopharynx acts mechanically as an obstruction to the Eustachian tube. The lymphadenoid structures of the pharynx, as a rule, participate in the morbid process.

The accumulation of thick viscid mucus in the post-nasal cavity, and adhering there, causes the patient to hawk until the secretion is dislodged and expectorated; this constant hawking causes congestion of the pharynx and induces a relaxed condition of the soft palate and uvula. Hypertrophic rhinitis is generally bilateral, but it is not always equally prominent on both sides; if at all considerable the occlusion of the nasal passages obliges the patient to breathe through the mouth, which causes dry throat, catarrhal laryngitis, hoarseness, bronchitis, and asthma. The secretions always contain leucocytes; the retention of the secretion in the nasal cavities causes it to become muco-purulent, blood stained, and sometimes fœtid. All the symptoms of simple chronic rhinitis are intensified, the interference with nasal respiration being most prominent.

Diagnosis.—The speculum and the rhinoscope should both be used in making the examination. Hypertrophic thickening usually affects the lower, but occasionally the middle, turbinated body, while polypi are attached most frequently to the middle and superior turbinated bones and their corresponding meatuses. Polypi are seldom found singly. Hypertrophy and polypi sometimes coexist. The swelling produced by chronic perichondritis may simulate a hypertrophy. The differential diagnosis between hypertrophic rhinitis in its early stage and chronic catarrhal rhinitis is difficult on account of the similarity of the changes in the tissues. As the hypertrophic process continues the epithelial cells increase in number and undergo fatty degeneration. New connective tissue is formed by the organization of the infiltration into the basement membrane and the submucous layer, the blood-vessels are increased in proportion to the formation of new tissue, and the sinuses become enlarged and thickened.

Treatment.—Attention to the general health of the patient is very important. The secretions and excretions of the body must be inquired into, and any faulty action corrected by appropriate measures. The use of alcohol and tobacco should be interdicted. Daily baths in tepid water, which is cooled to 60° Fahr. before emerging, followed by brisk rubbing with a coarse towel, should be encouraged.

As almost every case can be cured by suitable treatment, any of the various methods employed should comply with the degree and character of the hypertrophy. In the early stages, when the secretion is soft, cleanliness should be secured by the use of the atomizer through the anterior nares. Great care must be enjoined in its use, as mechanical irritation encourages the morbid process. When the overgrowth is fully established, the excess must be removed and the remaining structures healed by appropriate after-treatment. This reduction may be accomplished by the use of chromic acid, trichloracetic acid, or nitric acid, galvano-cautery, the cold-wire snare, and the galvano-cautery snare. The membrane should first be anæsthetized by the application of a five per cent. solution of hydrochlorate of cocaine. Caustic acids should be employed with extreme caution, and never upon the septum, as their action is very powerful and may cause deep ulceration or perforation. Of the acids named, chromic acid is the best.

A few crystals of chromic acid may be fused on the end of a flattened aluminum probe, which is to be applied to the most protuberant portion of the membrane throughout its whole length. These applications should be made at intervals of from ten to fourteen days. Decomposition of the acid occurs if the probe is overheated. Any excess of the acid may be neutralized immediately afterward by atomizing the naris with a saturated solution of bicarbonate of sodium.

Anterior hypertrophies are best removed by the galvano-cautery, giving rise to but little pain and slight inflammation. The flat, spatula-like platinum point should be heated to a dull cherry-red; *white* heat may cause considerable hemorrhage. The point is introduced into the naris cold; when it has been passed to the posterior portion of the protuberance the current is turned on and the heated point is drawn from behind forward across the swelling, so as to score it deeply. Another method consists in plunging a heated cautery point deeply into the swollen tissues, and moving it about freely in the deep parts while at a red heat. The advantage of the latter method is that there is less destruction of the superficial structures. In order to protect the membrane opposite the hypertrophy to be operated upon, the use of a speculum provided by a shield is advised. This speculum also prevents the possibility of the margin of the nostril being singed, which accident causes severe and lasting pain. Adhesions of the cauterized membrane to the septum can be prevented by the interposition of lintine between the surfaces for as long a time as the inflammatory process continues.

The application of caustic acids or the galvano-cautery to hypertrophies of the posterior portion of the turbinals is attended with some danger, on account of the proximity of the Eustachian tube. For the removal of projecting, freely movable polypoid, or cauliflower-like masses, it is much safer to use the cold-wire snare, passing it through the inferior meatus and adjusting it to the protuberance by aid of the finger in the nasopharynx, having previously transfixed the tissue to be removed with a long needle, the loop of the snare being adjusted behind the projecting point of the needle. By slowly tightening the snare excessive hemorrhage may be prevented. Free bleeding may be arrested by the application of styptic, see formula 8. Daily cleansing with the post-nasal syringe should be practiced, using solution (formula 1 or 2), followed by the application of Calendulated Benzoinol, or dusting the part with aristol, or acetanalid and boric acid, equal parts.

In some cases, especially in a narrow nasal passage, the hypertrophy of the inferior turbinated body causes such a degree of obstruction that a partial or complete removal of the bone is necessary. This operation can be performed, according to the circumstances of the case, by means of the saw, trephine, Teets' punch forceps, or the galvano-cautery loop.

Hypertrophic thickening is liable to develop as a consequence of abnormal conditions of the septum ; in such cases the deformity of the septum should first receive treatment. Turbinal tissue should not be sacrificed to make room for septal abnormalities.

ATROPHIC RHINITIS.

(SYNONYMS : *Rhinitis Chronica Atrophica Fetida ; Dry Catarrh.*)

The atrophic form of rhinitis, though less common than the hypertrophic, is invariably a secondary affection, cirrhotic in character, resulting in degeneration not only of the mucous membrane but of the underlying tissue and spongy bone, which thus renders the calibre of the nasal passages abnormally large. Clinical and pathological facts render it highly probable that atrophic rhinitis is the sequel of a pre-existing hypertrophic condition. While primary degenerative atrophy of the intranasal structures can not be denied, its occurrence must be reckoned among the exceptions to the rule.

The terms atrophic rhinitis and ozæna have been used interchangeably by many writers. The indiscriminate and indefinite use of the word ozæna has led to considerable ambiguity of its exact significance, because of its unqualified use, every affection of the nasal passages in which the expired air was fetid being called ozæna. The term ozæna should not be used to represent disease *per se;* it is a symptom of a number of pathological conditions. It may occur as a complication of nasal or post-nasal growths, and may be symptomatic of simple or purulent inflammation of the accessory sinuses. It occurs in all ulcerative diseases of the nasal mucous membrane, *e. g.*, syphilis, cancer, glanders, tuberculous, phagedenic, and other ulcers, lupus, rhinoliths, and is present in caries and necrosis of the bony framework of the nose, but the stench is symptomatic only of these disorders. Ozæna occurs in children or adults from some vice of constitution, inherited or acquired. It is not necessarily present in all cases of atrophy, but its supervention is probable; the capacity of the nasal chambers may be greatly increased and yet no odor can be detected. The atrophy that results from simple inflammation is less liable to give rise to the characteristic stench than that which depends upon constitutional causes. In simple atrophic rhinitis there is no ulceration or diseased bone, the fetid odor being dependent on changes in the retained secretions. Ozæna, while due to caseous degeneration of the epithelium, is dependent upon the intensity of the cirrhosis and the diathesis and environments which favor the propagation of the *bacillus fetidus.* Two peculiar organisms have been isolated from the discharge. The one is the *bacillus fœtidus ozænæ* of Hajak; the other is the *bacillus smaragdinus fœtidus* of Reimann, both giving rise to a powerful putrefactive odor.

Some cases of atrophic rhinitis are seen in childhood, the youngest being about eight years of age, but generally they are first observed about the time of puberty, and most often in the female sex. Adults will invariably trace this disease back to early life. The development of the disease in early life is probably due to some constitutional taint.

The deviation of the natural contour of the nose, being upturned at the tip; a preternatural roominess of the nasal cavities, permitting of the easy entrance of irritating particles from the surrounding atmosphere; the inhalation of dust, irritating gases, and insanitary atmosphere; deviation of the septum; cartilaginous growths, and other conditions causing hypertrophic rhinitis, may result in atrophy. While diseases of malnutrition do not cause atrophic rhinitis, they undoubtedly cause a predisposition to the affection, and render it more intractable when it does occur. Atrophic rhinitis may be the result of any inflammation, acute or chronic, specific or non-specific, whether excited by exposure to cold or continuous inhalation of irritating dust, vapors, etc., which ends in a purulent discharge, and which is sufficiently prolonged to wash away the epithelia and and destroy the nasal mucosa, turbinates, etc.

The most characteristic symptom is the tendency to the formation of crusts, which vary in color from a greenish-yellow to coal-black. They may accumulate in thin scales, or in large masses of horny consistence, and may even occlude the nostrils at times. They may be soft or tough, and sometimes they are quite dense in the centre while moist externally. They adhere most tenaciously to the mucous membrane, and their dislodgment is often attended with great difficulty. They occur in all portions of the nose and nasopharynx. The tendency to inspissation of the discharge and the formation of crusts is due to atrophy of the mucosa, submucosa, vascular plexus of the turbinated bodies and the bone itself, and to degeneration of the mucous glands. The perception of smell and taste may be impaired or even entirely destroyed.

After thoroughly cleansing the nostrils of all crusts and mucosities by means of a detergent spray, a careful anterior and posterior rhinoscopic examination should be made to distinguish atrophic rhinitis with fetid secretions from those diseases in which ulcerations, necrosis, polypi, foreign bodies, etc., are present. After the removal of adherent crusts the mucous membrane is found to be less vascular than normal, smooth, slightly inflamed, but thoroughly intact. Abrasions may occur if force be employed in removing crusts, but in uncomplicated atrophic rhinitis there is no ulceration.

The **prognosis** is dependent upon the constitution, surroundings, occupation, age, habits, and other influences pertaining to the individual. If the disease has existed quite a length of time, and is well established, it is unmistakably bad. Under favorable conditions it is possible to arrest its progress, and in most cases relief can be obtained and the fetor kept under control by a persistent and long-continued therapeutic, hygienic, and dietetic régime. The disease is obstinate in the extreme;

but if more attention should be given to the improvement of the general health, and the patient be employed at out-of-door work under favorable hygienic and sanitary conditions, the resulting benefit would be immeasurable.

Systemic treatment should be administered in accordance with the requirements of the individual case. The symptoms of the anæmic condition, loss of appetite, emaciation, debility, and malnutrition should be carefully considered. The maintenance of bodily strength and the designation of a well-regulated and sustaining system of diet, giving heed to the regular alvine evacuation and renal secretory function. The body should be comfortably but not weightily clad, and every attention paid to cleanliness and perfect action of the cutaneous function Plentiful amount of exercise, *thorough ventilation*, and avoidance of undue exposure should be enjoined.

The most important object in the treatment of this disease is to effect and maintain a condition of cleanliness in the nose. The nasal passages should be thoroughly cleansed, preferably by means of the post-nasal syringe, at least once every day by the physician, being careful to wash away the minutest particle of secretion; in very bad cases the patient should be instructed how to cleanse the cavity at regular intervals, two or three times daily if the formation of crusts is rapid, by means of the hand-ball atomizer, using solution of formula 11. It may be necessary to continue this daily cleansing process for many months if the symptoms are to be kept in complete abeyance. When the mucous membrane is perfectly clean an application of solutions, formula 7, or of ichthyol (of forty or sixty per cent. strength) may be made to the whole of the diseased areas.

Besides the cleansing of the nasal passages it is important that the imperfectly nourished mucous membrane and subjacent structures should be stimulated to prevent or retard the formation of crusts. To effect this end Gottstein devised a method of treatment, which consists in the introduction of tampons of absorbent cotton, so placed in the nasal cavity as to come in contact with the entire affected mucous membrane. The mechanical irritation of the cotton stimulates the surface, producing a slight but constant flow of mucus. These tampons should be retained in the nostril for an hour or more daily, in one nostril during the morning, and in the other nostril during the afternoon. These tampons can be made by wrapping absorbent cotton around a knitting needle until it has assumed the desired bulk and shape; then it is removed from the needle and inserted into the nasal cavity.

Another way of stimulating the mucous membrane is by the use of a mild galvanic current, the negative pole being applied directly to the mucous membrane by means of a copper wire wound with cotton, moistened with a saline solution; the positive pole may be applied to the nape of the neck. Destructive applications, such as cauterization, should be censured, as this causes further devitalization.

All methods that have any value in the treatment of atrophic rhinitis require patience and care on the part of the physician and the persevering co-operation of the patient.

Alumina.—Chronic nasal catarrh, with discharge of indurated masses of mucus; nose is sore internally, and sometimes ulcerated. In post-nasal catarrh, with loss of smell and pain at root of nose (Natrum muriaticum).

Kali bichromicum.—Tough, adherent masses of greenish offensive mucus in posterior nares; large plugs or clinkers in the nose, the detachment of which leaves very sore places or ulcers.

Hepar sulphuris calcareum.—Soreness of the bones, heat, ulceration; nose very sensitive internally to air and to touch; profuse greenish-yellow discharge, very offensive (**Graphites, Kali iodatum, Pulsatilla, Magnesia muriatica**).

Elaps.—Stoppage and stuffiness high up in the nostrils; offensive discharge, occasional nosebleed; posterior nares and pharynx covered with dry greenish-yellow secretion; nose always stuffed up with plugs of dry mucus.

SYPHILITIC AFFECTIONS OF THE NOSE.

(SYNONYMS: *Syphilitic Rhinitis; Nasal Gumma; Tertiary Nasal Syphilis.*)

The characteristic inflammatory condition of the mucous membrane of the nose in Syphilitic Rhinitis is rarely induced by the presence of the primary chancre, though the nostrils may be infected by direct contact with the syphilitic purulence. In the secondary period the nasal mucous membrane may occasionally be the seat of macules, papules, erosions, mucous patches, and ulcerations, with catarrhal symptoms, the discharge becoming purulent and sanguinolent. The orifices of the nostrils are frequently affected, where small cracks and fissures are present and are apt to become covered with crusts, causing much discomfort. A syphilitic affection of the nose appears in its most characteristic manner in the tertiary period of the disease. It may appear six months after infection, or after many years—sometimes without any manifestation of other tertiary symptoms. Gummata are most commonly located on the cartilaginous or bony portion of the septum; the infiltration usually involves the whole thickness of the mucous membrane, the deepest layer of which constitutes the perichondrium and periosteum; degeneration of these gummata leads to ulcerative changes and necrosis of these structures. The floor of the nose, the antrum, the Eustachian tube, the roof of the nose, and even the cerebral meninges may be attacked by extension of the disease from one point to another.

Symptoms.—The symptoms are redness, dryness, and itching, followed by copious secretion of mucus. The obstinate catarrhal inflammation of the nasal mucous membrane may persist for weeks or even months. There is a general swelling of the nose and thickening of the nasal bones, due to perichondritis or periostitis, and the deposit of gummatous formations. These gummata may be absorbed, leaving a cicatricial contraction, or they may break down and produce ulcers, which extend rapidly, and give rise to a muco-purulent or purulent discharge. These ulcerative changes give rise to an offensive odor, nasal phonation, and partial or total loss of the olfactory sense. Closely adherent greenish crusts form in the nasal passages, the patient complains of nasal obstruction, pains in the eye, cheek, and forehead, which are aggravated at night. After a time particles of necrosed tissue may become loosened and be discharged anteriorly with the secretions, or they may fall back into the pharynx and be expectorated. The deformity of the external nose is dependent upon the site of the gumma and extent of the destructive process. The tip of the nose becomes flattened if the cartilaginous portion of the septum is destroyed, while the bridge of the nose becomes depressed if the nasal bones be implicated to any considerable extent. The diffusion of the necrotic process to the osseous structures in close proximity to the brain renders likely a fatal issue. If the floor of the nose is involved in the gummatous infiltration, necrosis of the hard palate may result, the nose, mouth, and pharynx thus becoming a common cavity. Necrosis is produced where the inflammation and degeneration of the vascular periosteum cut off the nutrition of the bone. The dead bone, acting like a foreign body, sometimes excites the neighboring living bone to caries and necrosis. Perforations of the cartilaginous septum are common; these perforations are usually posterior to the columnar cartilage, are of rounded form, the edges being covered with adherent crusts.

Diagnosis.—It is often difficult to distinguish this disease from lupus exedens when the latter commences *within* the nose. Lupus appears at an earlier age than does syphilis, except in the hereditary form. Abscess of the septum; deviation of the septum, and hypertrophy of the turbinated tissue might be mistaken for nasal gumma. The absence of fluctuation commonly observed in septal abscess; the absence of a depression on the opposite side of the septum usual in deviation, and the peculiar elasticity to the touch of the probe in hypertrophy of the turbinated tissue will mark the difference between these affections. The nocturnal pain is never absent in nasal syphiloma.

Prognosis.—A favorable result can be secured by the recognition of the disease and the institution of treatment at the time of the manifestation of the early symptoms. Medical treatment both alleviates and shortens the course of the disease, and diminishes the liability to relapses. The prognosis is more unfavorable in the young and growing, and in the aged and enfeebled, than in vigorous and young adults.

Treatment.—The patient should live as much as possible in the fresh air and sunlight; the diet should be nutritious and easily digested, consisting largely of milk, meat, and vegetables. Tobacco and alcoholic drinks should be prohibited, and excesses of all kinds avoided. Daily baths in lukewarm water are essential. The necessity of daily alvine evacuations, and formal regulation of the hours for sleeping, should be insisted upon.

The nasal cavities can be greatly assisted into a healthy condition by washing them out, *at least twice daily*, with solution of formula I. Mucous patches, condylomatous growths, and ulcerations may be excited to healthy action by applications of tincture of iodine or the fused nitrate of silver. Insufflations of iodoform or aristol will frequently prove beneficial.

Surgical methods should be employed with great caution. The judicious scraping out of the ulcerative deposit by means of a curette or a sharp spoon will be of great advantage in hastening the reparative process, being careful not to exert too much pressure over the cartilage and so cause penetration. After curetting, the electro-cautery or nitrate of silver may be applied to the remaining indurated tissue. In order to put a stop to the destructive process, and to remove the cause of the horrible odor, the necrosed bone should be carefully removed, thereby saving the neighboring living bone from destruction. Too much force must not be employed in severing the sequestra, which may be taken away with appropriate forceps. Necrosed portions of bone can be readily removed by the electric burr.

THERAPEUTICS. **Aurum.**—Nostrils ulcerated, agglutinated; patient cannot breathe through the nose. Inflammation, with deep-seated destruction of tissues; caries of the nasal bones, which are very sore to touch; fetid, purulent, bloody discharge; boring pains, aggravated at night.

Asafœtida is useful in periosteal inflammation and ulceration; the discharge is offensive.

Cinnabaris.—Subacute and chronic rhinitis, with pain about the root of the nose, extending into the bones on each side.

China and **Phosphoric acid.**—When patient is very weak and has great coldness of the skin.

Fluoric acid.—Chronic rhinitis and ozæna.

Hepar sulphurius calcareum.—Nose is very sore, swollen, and red, and very sensitive internally to air and to touch; soreness of the bones, heat, and ulceration; profuse and very offensive greenish-yellow discharge.

Kali bichromicum.—Ulceration of septum, and purulent inflammation of whole nasal mucous membrane. Tough adherent secretions covering ulcerated spots. *Detachment of the nasal plugs leaves very sore places or ulcers.*

Kali iodatum.—Profuse acrid, watery discharge, with most terrible pains; patient is alternately cold and hot.

Mercurius corrosivus.—Nostrils very sore; ulcers within the nose; discharge is excoriating, particularly if there is a thick, gluey discharge from the nose, always associated with burning pain.

Silica.—Offensive, purulent, and bloody discharges, with ulceration.

HEREDITARY SYPHILIS OF THE NOSE.

Congenital syphilis is unquestionably often conveyed by inheritance from either parent, manifesting itself within the first six weeks; the disease may, however, be latent, and appear unexpectedly at a much later period. Infants in whom the symptoms of syphilis are evident at birth are usually puny and undeveloped, and present a prematurely aged appearance. Sometimes the child is apparently healthy at birth, and even shows a progressive gain in weight. As a rule, the child presents a peculiarly sad appearance, and although nursing with avidity it does not become plump. The child snuffles as with a cold, is restless and feverish, and suffers from more or less diarrhœa. Finally the child begins to perceptibly fail in health and strength, becoming weak and emaciated, and cries almost continually. The subcutaneous fat diminishes, and the skin, about the face particularly, becomes dry, harsh, wrinkled, and sallow. Mucous patches, or moist papules, are the characteristic manifestations of hereditary syphilis. The accompanying rhinitis produces a thin, watery discharge at first, but soon becomes muco-purulent, causing irritation and finally excoriation of the skin and mucous membrane at the margin of the nostril and of the upper lip; this secretion accumulates in the nares to such an extent that breathing is interfered with, giving rise to the peculiar snuffling sound. As the disease progresses the obstruction increases, and finally becomes so complete that no air passes through the nostrils. The inability of the child to breathe through the mouth and suck at the same time, nursing is rendered difficult or impossible. The child thus suffers from want of nutrition, and also from pain, becoming more and more emaciated, death ensuing in a short time from inanition or from an exhausting diarrhœa, or from bronchitis, pneumonia, or other visceral disorder. In less severe cases an apparent recovery sometimes takes place. The poison frequently remains in the system, however, and becomes manifest at a later period.

The **prognosis** of hereditary syphilis varies in accordance with the extent and severity of its lesions, the time of their manifestation, and the general condition of the child. Children who are born apparently healthy, and who remain free from any affection of the skin or mucous membrane for several weeks, seldom develop the malignant form of the disease.

The mother should suckle the child if able to do so; if not, the infant must be fed with cow's milk or some of the various substitutes for its natural food. The risk of communicating syphilis renders it imprudent to employ a wet-nurse. Whole families have been infected by nurses who unwittingly contracted the disease from the lips of syphilitic infants while in their charge.

It is very important that the infant's nose should be kept clean; but the difficulty of applying local treatment has resulted in negligence. If the spray or post-nasal syringe are impracticable, the nostrils must be cleared regularly with a camel-hair pencil dipped in a solution of permanganate of potash (grs iij, water ℥ j), being very careful not to employ too much force.

Kreosotum is thought by Teste to be a specific for syphilis in nursing children, and states that it affects a radical cure without the intervention of Mercury.

NEW GROWTHS.

NON-MALIGNANT :—Myxoma ; Fibroma ; Papilloma ; Cystoma ; Enchondroma ; Osteoma ; Exostoses.

MALIGNANT :—Sarcoma ; Carcinoma.

The growths which are most frequently found in the nasal cavities are benign in character. The myxomata or gelatinous polypi occur ordinarily in small pedunculated masses, ranging in size from a currant to a grape, but occasionally larger, causing more or less obstruction of the nasal passages, with the accompanying symptoms. They form soft, frequently fluctuating, semi-translucent masses, for the most part poor in blood, are of a soft or firm gelatinous consistency. They may be sessile or pedunculated, more or less movable, single or multiple, pear-shaped, or irregularly lobulated to fit the cavities in which they lie. They rarely, if ever, spring from the mucous membrane covering the septum, but are most frequently connected with the anterior portion of the middle turbinated bone, and are not infrequently present in the accessory cavities, especially the antrum. They tend to fill the cavity of the nostril, sometimes hanging down behind the uvula into the pharynx. Zuckerandl states that polypi of oval shape with small pedicle grow from sharp edges, while those of round shape and broad base are attached to flat surfaces ; and he also maintains that each kind preserves its peculiar shape from the time of its first appearance. They occur more frequently in the male sex, and seldom under the age of sixteen.

There is a marked susceptibility to attacks of rhinitis ; the discharge is of an ordinary and simple character. The fullness of the nostrils gradually causes so much obstruction as to interfere with respiration and the voice, particularly during damp weather, when the hygroscopic nature of the growths causes them to become fuller and paler in color. Frontal headache is common, often associated with aprosexia. The olfactory sense is either blunted or destroyed by reason of the mechanical obstruction of the growths, the same cause operating to close the nasal duct and Eustachian tube. Polypi are usually common in one nostril; but in well-established cases both nostrils are involved, the enforced mouth-breathing constituting pharyngitis and laryngitis as complications.

Many reflex phenomena are attributed to diseases within the nose—as asthma, cough, epilepsy, chorea, supra-orbital headache, etc. A close inspection of the nasal cavity and careful elimination of the symptoms frequently due to other conditions will result in the proper diagnosis. Many observers, after careful investigation of the subject of reflex effects of nasal obstruction, maintain that when these sources of irritation are removed the reflex symptoms disappear.

Their characteristic appearance and location, their softness, elasticity, and freedom from pain will serve to distinguish them from any other growth likely to be met with. Mucous polypi differ from fibrous, cancerous, and sarcomatous growths, in that the former do not bleed easily when touched, and rarely cause disfigurement. Deviation of the septum has been mistaken for them, but this can be avoided by examining both sides of the septum. As polypi rarely are situated on the septum, as a rule they can be differentiated from abscess of the septum and other growths of this part of the nose. The easiest method of distinguishing polypi from hypertrophy of the mucous membrane covering the lower turbinated bones is by the application of cocaine; under its influence the hypertrophied mucous membrane will become retracted, while the polyp will be unaffected.

Under the microscope these growths show all the elements of the hypertrophied mucous membrane, the glands of which may have been absorbed, or have undergone cystic degeneration, or have remained unaltered. There is an irregular network of connective tissue holding a structureless mucoid material between its meshes, a few dilated capillaries, but no nerves. The blood-vessels are scanty, except at the point of attachment, which is very vascular. The external covering of these growths is usually composed of ciliated epithelium.

Treatment.—The interior of the nose should be very thoroughly exposed and well illuminated. The operation of evulsion consists in seizing the growth as close as possible to its base, the blades of the forceps being tightly compressed; the growth is forcibly torn or twisted from its attachment. If the growth be situated far back, it may be more easily reached through the pharynx, the instrument being guided by the index finger. The administration of nitrous oxide gas greatly facilitates this operation.

The snare is the better instrument in all cases in which the mass can be engaged in the wire-loop; but when situated high up in the nasal fossa some form of biting forceps may be required. By abscission nasal polypi may be removed with a minimum of pain and with little or no hemorrhage. The method of evulsion causes severe pain, copious hemorrhage, and constitutional depression; this method should not be employed except by expert operators.

The galvano-cautery snare can be advantageously and successfully employed in certain cases, but extreme caution should be exercised when it is used in the upper meatus. This method possesses the advantage of being less painful than by the other methods, and there is no hemorrhage.

The local application of astringents and caustic pastes, and the injection of escharotics into the polypi can only be of service in temporarily relieving the annoying nasal obstruction, rarely resulting in the complete removal of the growths.

The tendency to recurrence is sometimes due to the presence of smaller growths not discernible at the time of operation, which grow more rapidly when relieved from pressure of the larger polypi; in other cases the bone from which the polyp grows has become diseased, and requires removal. The application of the galvano-cautery to the site of the polypi, or a strong solution of Iodine or Chromic acid, to destroy thoroughly any remaining polypoid tissue, will insure success. Great care must be exercised to confine their use *absolutely* to the parts desired.

Calcarea carbonica. — Intermittent swelling, especially at root of nose. Ulcerated and scabby nostrils; tendency to nosebleed in fat children. Thick, purulent, fetid discharge, with offensive smell in nose. Nasal polypi.

Phosphorus.—Chronic nasal catarrh, with green, bloody mucus. Caries of the bones of the nose; ulcerations of the nose, with stoppage; hemorrhage and offensive odor; nasal polypi.

Sanguinaria.—Nasal polypi which tend to bleed easily. Pain over the root of the nose; burning and rawness in the nose, with fluent coryza which excoriates.

Teucrium.—Rhinitis, with expectoration of solid chunks from the posterior nares; nasal polypi.

Thuja.—Useful in the hydrogenoid constitution. Painful scabs in the nostrils. Nasal catarrh, with quantities of thick, green mucus, pus and blood.

FIBROMATA, OR FIBROUS POLYPUS OF THE NOSE.

This variety of tumor occurs with comparative infrequency. The combination of fibrous with mucous tissue is relatively frequent, forming the fibro-myxoma. Fibromata may originate from any portion of the nasal cavity, but their attachment is usually in the posterior portion of the nasal fossa, arising from the periosteum and sometimes from the bone proper. If attached to the inferior turbinated bones or the floor of the nose, the tumor may hang down into the nasopharynx; if situated in the roof of the nose it may invade the adjacent cavities. The etiology of pure fibroma is unknown. The growth of the tumor is slow and constant; it is usually sessile, having a very broad base.

Fibromata are composed of dense white fibrous connective tissue, with a large number of cells and nuclei. They have a very abundant supply of both arteries and veins. The extirpation of the growth may give rise to considerable hemorrhage.

In appearance the tumor is a red, fleshy-looking mass, tender, liable to bleed, and is frequently ulcerated, accompanied with a purulent and even fetid discharge. To the touch, with probe or finger, the tumor feels quite hard and rigid.

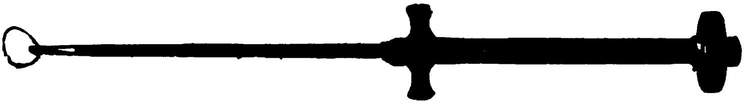
The growth at first causes the ordinary symptoms of mucous polypus. The discharge of viscid transparent mucus is followed later by a purulent discharge and frequent attacks of epistaxis. In its unremitting growth, becoming hard and unyielding, it causes absorption and displacement of the surrounding structures, pushes the septum to one side, penetrates the orbit, extrudes the eyeballs, forces the walls of the antrum outwards, and even enters the cranium and compresses the brain.

Anterior and posterior rhinoscopic examination, aided by the probe or finger to test the consistency and mobility of the tumor, must be employed as a means of diagnosis. This is a dangerous tumor, because of its position and the severe hemorrhage which may follow its injury. The tendency to recurrence after extirpation seems to be due to the incompleteness of the operation, which is often rendered difficult by the fibrous bands of the tumor reaching out into the other tissues.

If the size of the tumor will permit of operation through the ordinary channels, its removal should be effected by means of the snare or galvano-cautery, slowly cutting through the growth. Electrolysis has in some cases been successful in causing arrest of the growth. When the tumor has attained considerable magnitude a more formidable operation at the hands of the general operating surgeon is deemed advisable.

CYSTIC POLYPI.

These growths may occur alone or in combination with mucous polypi. They may arise as the result of a degeneration of mucous polypi, due to the liquefaction of the myxomatous tissue. They consist of a delicate membranous capsule or sac, which is filled with a serous fluid. This envelope is easily ruptured, either by accident or spontaneously, causing collapse of the growth. They are found in a mucous follicle, or in the duct of a muciparous gland. Their usual situation is at the posterior portion of the lower edge of the middle turbinated bone.



Lester's Polypus Snare.

Their removal with the snare is simple, and there is little tendency to recurrence.

PAPILLOTOMATA.

True papilloma nasi is a rare disease. Nasal papillotomata consist of hypertrophied papillæ covered by an envelope of epithelial scales; they are generally situated on the alar cartilage, or on the lower anterior portion of the septum, or the lower turbinated bones; are met with more frequently in young people, and are probably caused by want of cleanliness and by local irritation.

Local application, by means of a cotton pledget, of Tincture of Thuja occidentalis, and the internal administration of either of the following-named remedies, will cause their speedy removal:

Causticum excrescences have a solid body and are very horny.

Thuja warts are fissured, cut up, having a cauliflower appearance.

ENCHONDROMA.

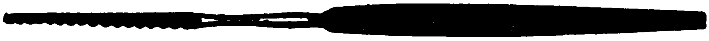
Enchondroma, chondroma, or catilaginous tumor, is a tumor of varying size, with smooth or lobed surface, and seldom consists of cartilage alone, being very often associated with a formation of bone, the latter by constant growth finally forming the chief mass of the tumor. Enchondromata occur especially in young individuals, about the age of puberty, and show a proneness for the male sex. They are of rare occurrence in the nose; their growth is for the most part slow, but they sometimes attain considerable size.

These growths are attached by a broad base; as a rule they are hard, but may be soft; their immobility and hardness are greater than of the fibrous polypus.

They may be removed with the knife, chisel, or galvanocautery snare.

ECCHONDROSES.

Ecchondroses, cartilaginous outgrowths, occur not infrequently on the anterior and lower part of the septum, to which they are generally attached by a broad base, or adjoining parts on the floor of the nose. They are often associated with deviation of the septum. If their presence causes nasal obstruction or irritation, their removal may be effected by means of Fuld's knife, which is modelled on the principle of the Christy bread knife. It cuts readily through the most coriaceous cartilage.



Fuld's Knife.

EXOSTOSIS.

An Exostosis is a tumor-like osseous new formation, firmly attached to the bone. It is a manifestation of an increased physiological activity of the periosteum; in the majority of cases some general disease, as syphilis, rheumatism, or rhachitis, has a part in the causation, though traumatism is often the assigned cause. In the nose a bony crest or ridge is frequently found extending from the junction of the septal cartilage and the vomer, running obliquely upwards and backwards. Sometimes they arise from the floor of the nose. They are recognized by their hardness. Exostoses are apt to resemble the type of bone from which they spring.

When they cause stenosis or irritation, they may be removed with the saw (Curtis', Bosworth's, or Myles'), or with the drill or trephine.

OSTEOMA.

Osteomata, or osseous tumors, are rarely found in the nose.

MALIGNANT GROWTHS.

Nasal Sarcomata are not of frequent occurrence, although they are much more common than carcinomata and epitheliomata. Though most frequently attached to the sides of the nasal cavities they may start from any part of the passage. Their causation is still undetermined. They are single and sessile, and sooner or later implicate the lymphatic glands. They appear as fleshy, succulent tumors, bright red or of a dirty ashen hue, readily softening, ulcerating, bleeding, and attended by fetid discharges and with pain, increasing as the growth extends.

Early and complete extirpation of the growth presents the only chance for recovery. The tumor will, however, return with greater malignancy if imperfectly removed. Any sedative or mild styptic application is permissible—a ten per cent. solution of cocaine; or, Iodoform, twenty grains, Tannic acid, ten grains, sugar of milk, twenty grains.

Carcinoma originating in the nasal fossa is rare, but it may invade the nasal cavities from surrounding parts. No operation should be attempted. Beyond observance of cleanliness, the application of sedatives or anything of a tranquilizing nature, nothing can be done. Operative procedures neither lengthen life nor alleviate suffering.

LUPUS OF THE NOSE.

Lupus of the mucous membrane of the nose is usually associated with cutaneous disease at the same time. In some cases, however, it occurs primarily in the nasal mucous membrane.

Lupus is a cellular new growth, of the nature of granuloma. It is met with in children and young persons, and many cases have associated with them the elements of struma and tuberculosis. It is neither congenital nor hereditary, and occurs in both sexes in about equal proportions.

The disease commences on the cartilaginous septum as tubercles, dull red in color, which gradually increase in size. A thin adherent crust forms upon their summit, which, if removed, will expose an ulcer. After a variable time more or less extensive ulceration takes place in one part, while healing action may be going on in another. Sometimes this process is very slow, and again it is very rapid. There is a foul discharge from the nose. The destructive action of the disease occasions considerable deformity. In the earlier stages there are no subjective symptoms, but when ulceration has set in pain may be present. In lupus *non-exedens*, there is no ulceration, but there is an atrophy of all the tissues affected.

The characteristic features of this disease are its occurrence in early life; the existence of primary eruptive spots; their development into papules, tubercles, and ulcers; the chronic course of the disease; and the attempt at repair in the shape of unsightly cicatrices. Syphilis and lupus may coexist in the same patient, but lupus may be distinguished from the former affection by the previous history and the rapid development and characteristic grouping of the lesions. Lupus may be mistaken for epithelioma, but the history, appearance of the lesions, and the course of the diseases, are altogether different.

While the views respecting the pathology are still at variance, a number of observers asserting that they have shown the morphological identity of this disease with tuberculosis, yet all modern investigators agree that the morbid process appears as a chronic inflammation, and consists of small-celled infiltration, the blood-vessels acting the chief part in the genesis of the lupus infiltrate.

The **prognosis** is good in the early stages, while the lesion is small. When the lesion has attained the size of an inch or more in diameter, the condition may be regarded as hopeless.

Constitutional and local treatment should be employed at the same time, the former to act against and remove the source of the disease, and the latter to destroy the existing lupoid tissue. Bathing, exercise, plenty of fresh air and sunshine, and the observance of all hygienic and dietetic measures that add to general health. Good, nutritious diet, with large amount of milk. Cod-liver oil is a most efficacious remedy. The alimentary canal should always receive attention, and weak digestion regulated. Carefully select the remedy. **Tuberculinum** 200 is said to have cured a number of cases. Consult **Arsenicum, Calcarea carbonica, Hydrastis, Hydrocotyle, Cicuta, Rhus,** and **Sulphur.**

The surgical treatment includes the use of the curette, the knife, caustics, or the galvano-cautery. Every particle of the diseased tissue must be removed. When the bleeding has ceased, the parts should be cleansed; then thoroughly cauterize either with chloride of zinc, lactic acid, or nitric acid, and pack the naris with absorbent cotton. This treatment should be pursued until there is no longer any evidence of relapse. The galvano-cautery will sometimes prove of greater use than caustics.

DEVIATION OF THE NASAL SEPTUM.

A perfectly symmetrical nasal septum is seldom met with, but sometimes the deviation may not be sufficient to cause much annoyance to the patient from obstructed breathing. Deviation of the septum may occur either in the bony or in the cartilaginous portions, or it may exist in both portions in the same case; in the majority of instances the cartilage alone is affected. Various theories have been advanced as causative factors in their production, but according to Seiler they must be looked upon as the result of intranasal pressure, on one or the other side, during the period of development between birth and puberty. Delavan states that statistics show that a large proportion of nasal deformities manifest themselves between the ages of ten and twenty years—a period of great constructive activity—resulting from the receipt of injuries, or through improper development due to malnutrition.

The majority of cartilaginous deflections are probably the result of direct injury, resulting either in fracture or dislocation. In these cases the tip of the nose is turned toward the lower margin of the dislocated cartilage, the degree of obstruction in the contracted naris, or even both nares, being proportional to the amount of deviation. The septum may be bent upon itself either vertically or horizontally—the latter being most frequent. The bend may be sharp and angular in some cases, while in others it may be rounded or obtuse, and may involve the whole or only a part of the septum. The so-called sigmoid deviation may obstruct one nostril in front and below and the posterior and upper portion of the opposite nostril.

Deviations of the septum may exist without causing any symptoms of obstruction. In other cases hypertrophy of the contiguous soft parts causes the nasal fossæ to become greatly occluded. Obstruction of the nasal passages necessities mouth-breathing, with its attendant consequences of catarrhal conditions of the Eustachian tubes, of the pharynx, larynx, and bronchi; pressure on the turbinated bodies will cause hyperæmia and subsequent hypertrophy of the tissues; frontal and occipital headaches; diseases of the accessory sinuses from imperfect drainage; interference with olfactory and auditory impressibility, and the manifestation of reflex symptoms in great variety. Removal of the obstruction is therefore necessary for the general welfare of the patient.

Cartilaginous, bony, or osteo-cartilaginous ridges or spurs are frequently thrown out on the nasal septum, and they should be distinguished, from a clinical as well as etiological viewpoint, from septal deflections or deviations. These spurs, ecchondroses, or exostoses may properly be considered as true inflammatory growths, resulting from plastic infiltration of the tissues involved, and are most commonly located along the sutural lines of the septum. Their most common site is the junction of the triangular cartilage with the superior maxillary bone, and often occlude the inferior meatus through contact with the inferior turbinated body. The hardness and impenetrability are characteristic features of exostoses.

Treatment.—The removal of bony or cartilaginous crests, ridges, or spurs, whether associated or not with a deviation of the septum, may be removed by means of the nasal saw, or by drills or trephines driven by an electro-motor. In simple deflections of the cartilage, accompanied with thickening of its substance and the presence of a prominent ridge, the redundant parts may be cut away with a knife or saw.

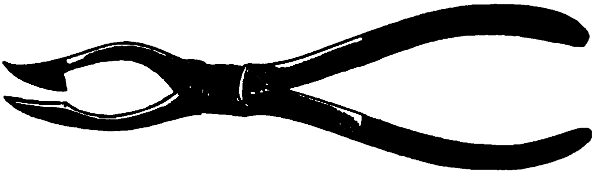
The position, degree, and form of the deviated nasal septum are of such great variety that no specific operation for the correction is applicable to all. In most instances a general anæsthetic will be required when operating for the correction of septal deviations.

Various simple methods—such as frequently repeated digital pressure upon the convex portion of the deviation, the insertion of tupelo-tents, bougies, etc.—have been recommended for correcting a deformity of the cartilaginous septum, but their employment is of doubtful value.

Dr. Adams' method of forcibly straightening the septum by means of forceps, and the subsequent insertion of splints to retain it in position, is mainly applicable in cases where the dislocation or fracture is of recent occurrence.

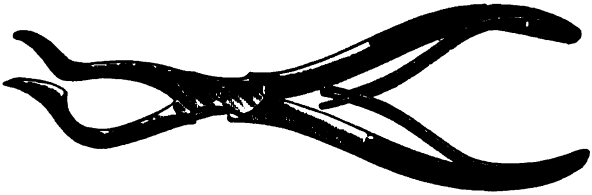
The object of all operations for deviated septum is to overcome the resilience of the cartilage; the means of obtaining this result necessarily varies with the case. In some cases a portion of the cartilage must be excised with the knife or saw, being careful to avoid perforation of the septum. Sometimes it is best to make an incision through the septum at the place of greatest curvature, so that the edges of the cut will overlap when it is brought into normal position, and so maintained by intranasal tampons. Various instruments have been designed for making the preliminary incisions. Dr. Asch recommends incising the cartilage with scissors, angular and straight.

Steele, Jarvis, and others advocate the use of punch forceps, with cutting blades of various shapes, for removing redundant tissue and thus to reduce the elasticity of the cartilage.



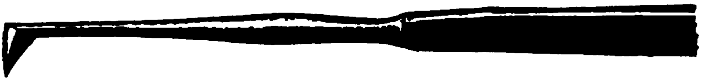
Asch's Straight Scissors.

With the use of the instruments as devised by Dr. B. Douglass, the following method of operation for the rectification of a deflected cartilaginous nasal septum will be not only comparatively easy of accomplishment, but will insure, in the majority of cases, a durable correction of the deformity and a suspension of the symptoms due to that condition if the technique is carried out as prescribed. Before the patient is anæsthetized the nose should be cleansed, by means of a post-nasal syringe, with solution, formula 1. At the time of operation the patient's head should be brought well over the end of the operating table, so as to be slightly dependent; this position of the head will facilitate the escape of blood from the nose and pharynx by gravitation, and lessen the liability of its entrance into the lower respiratory tract. The patient having been anæsthetized, the operator should introduce the little finger, well oiled, into the obstructed naris, to determine the point of greatest convexity, the presence of ridges, and whether they join each other or are separate, and whether there are one or more deflections. It is also important to ascertain whether

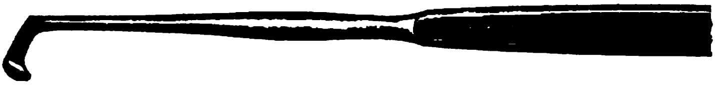


Asch's Angular Scissors.

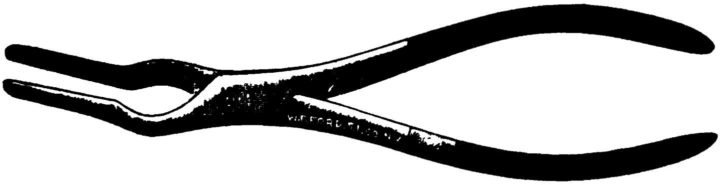
the cartilaginous septum has been deflected or displaced from its normal junction with the ridge formed by the union of the superior maxillary bones. The point of greatest deflection having been located, the spear knife is passed into the obstructed side and carried back to the posterior point of deflection; the point of the knife is then turned and pressed through the septum, the point, as it perforates, being felt by the finger in the opposite nostril. The object of the spear knife is merely to perforate the septum sufficiently to allow the introduction of a blunt-pointed bistoury. This bistoury is introduced on the obstructed side into the incision made by the spear knife, the finger in the unobstructed nostril acting as a guide. This knife is then drawn forward, with a slight sawing motion, along the ridge of convexity until it reaches a point anterior which is not deflected. All other ridges of deflection communicating with the main deflection should be incised in the same manner to their most remote points. Deflections of the septal cartilage from the maxillary ridge should be operated in the same manner as above indicated. When the septum is greatly thickened and has a broad base at its junction with the floor of the nose,



Douglass' Spear Knife.



Douglass' Blunt-Pointed Bistoury.



Septum Forceps.

causing obstruction, either the saw or the trephine may be used for its removal.

After the accumulated clots of blood have been removed from the pharynx and nasal passages, with an Adams' septal forceps, one blade in either nostril, the septum should be subjected to a twisting motion sufficient to thoroughly destroy the adhesions and overcome all resiliency of the cartilage. The further bending of the septum into the desired position may be accomplished by passing a finger into the previously stenosed naris, and by careful pressure cause the cut edges to overlap on the concave side. The bony septum should next be explored; if any deflections are present they should be removed with the saw, Teets' punch forceps, or broken wlth Adams' forceps.

After the introduction of the splints into the nares the hemorrhage, which up to this time will have been quite profuse, will cease spontaneously. These splints may be made of cork or vulcanized rubber. Some surgeons prefer the hollow and perforated tubes, while others give preference to the solid splints. They should be made with a straight lower border, the side which is next to the septum having a flat surface, while the side next to the inferior turbinated may be slightly concave. The inner end of the splint is made smaller than the outer end, so that it may be secured in the upper part of the ala nasi. Care should be used in selecting a splint that it is sufficiently large to hold the septum in the desired position, but it

Douglass' Rubber Nasal Splint.

McKernon's Nasal Splint.

should not be of such proportions as to cause painful and unnecessary pressure. A splint in either nostril will assist in supporting the septum in a correct position. The patient should be kept in bed for thirty-six or forty-eight hours. During the first twenty-four hours the nose should be cleansed twice with a tepid saline solution or that of formula 1 or 2. After twenty-four hours, and each day thereafter, when the splints are removed and the nasal passages are cleansed, the septum should be carefully inspected to note if any bulging occurs. If exuberant granulations make their appearance they may be easily removed by applications of nitrate of silver. The splint should be thoroughly cleansed in an antiseptic solution after each removal; it should be well oiled with Benzoinol and Aristol before it is reintroduced. If two splints have been used, the one which was placed in the unobstructed side may be removed and left out at the end of three or four days. The other splint should be worn day and night for three weeks; after that time it should be worn for two weeks, at night only.

Asch's Rubber Nasal Splint.

The remedy most frequently required is **Arnica**, which should be given until all pain, as of contusion, has been removed.

HÆMATOMA OF THE SEPTUM.

As a consequence of traumatism there may be an extravasation of blood between the mucous membrane and the cartilaginous framework of the septum, causing a swelling which may be unilateral or bilateral, and occasioning more or less obstruction. This tumor-like mass has a smooth surface, is purplish-red in color, and is situated just within the nostrils.

Hæmatoma should not be confounded with a syphilitic gumma of the septum. The consistency of the swelling, its origin by a broad base, and its fluctuation upon palpation, will distinguish it from cartilaginous growths and from polypus. Hæmatomata sometimes pass into septal abscesses, due to purulent degeneration of the effused blood.

The blood may be gradually absorbed if the extravasation be small in quantity; otherwise it should be relieved by aspiration or incision. The cavity should be washed out with carbolized water, after which the naris is to be packed, moderately tight, with iodoform gauze.

ABSCESS OF THE SEPTUM.

Acute abscess of the septum is generally due to traumatism, but may be caused by extension of a furuncular inflammation. As stated in the previous article, it may be due to the purulent degeneration of the effusion in a blood-tumor.

The swelling is symmetrical and bilateral, and generally situated at the anterior and inferior part of the septum. The nose is obstructed, and there is photophobia and profuse lachrymation. The extension of the inflammation gives the face an œdematous or erysipelatous appearance. Redness and sensitiveness of the nose are quite marked. Fluctuation can often be obtained from one nostril to the other.

Chronic abscess may result from injury, or it may be due to perichrondritis in syphilitic subjects. It has also been observed to occur in the course of smallpox and typhoid fever. The initial stage and progress are insidious, and the local symptoms are frequently trivial.

The course of acute septal abscess is often rapid. An early diagnosis is essential to prevent extensive destruction of the septum and marked external deformity of the nose. Perforation of the septum is a common result.

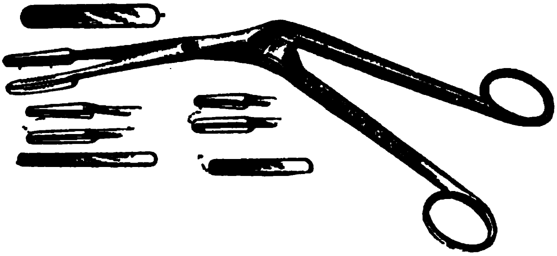
Aconite, Belladonna, Hepar sulphuris, Silica, and **Calcarea carbonica** should be administered as indicated. As soon as pus is detected a free incision should be made at the lowest point of the abscess on both sides of the septum, insuring free drainage by keeping the incision open by means of iodoform gauze. Absolute cleanliness of the nasal passages should be maintained by the use of mild antiseptic solutions.

SYNECHIÆ OF THE NASAL FOSSÆ.

Synechiæ are connecting bands of tissue extending from the septum to the turbinated bodies, and may be situated in any portion of the nasal cavity. They may be cartilaginous or bony, and are covered with normal mucous membrane. If located near the floor of the nose they interfere with the respiratory function, also serving as a lodgment for the thickened secretion and the production of stenosis.

The friction of the hypertrophied turbinals against the surface of the septum in the act of respiration causes an abrasion of the mucous membrane at the point of contact, which favors adhesion, and later the discharge of a mass of cartilage cells into the erectile tissue. Sometimes it is the vexatious result of cauterization, or other intranasal operations, in which directions for subsequent treatment have been disregarded.

Their removal is effected by means of the saw, or Teets' punch forceps, followed by careful dilatation until the opposing surfaces have become healed.



Teets' Punch Forceps.

Congenital Malformations of the Nasal Fossæ are comparatively rare. Of most importance is congenital atresia of the nares, which may be caused by membrane, or by fibrous tissue, or the adhesion of the turbinated bodies to a deflected septum. The atresia may occur anteriorly or posteriorly. Interference with respiration and sucking requires an early operation.

Membranous occlusion is most easily removed with the galvano-cautery; the saw and trephine are best adapted for operations on the septum and turbinated bodies.

PERIODICAL HYPERÆSTHETIC RHINITIS.

(SYNONYMS: *Hay Fever; Hay Asthma; Periodic Coryza; Catarrhus Æstivus; Rose Cold; Coryza Vasomotoria Periodica; Idiosyncratic Coryza, etc.*)

Sajous defines Hyperæsthetic Rhinitis to be an affection characterized by periodical attacks of acute rhinitis, complicated sometimes with asthma, occurring as a result of a special susceptibility on the part of certain individuals to become influenced by certain substances, owing to a deranged state of the nerve-centres. It manifests itself only provided the mucous membrane primarily affected in the course of an attack is in a state of hyperæsthesia, and when the irritating substances are present in the atmosphere.

The English and Americans are almost the only sufferers from this affection. In this country two seasonal varieties prevail, one occurring in the spring (June cold, rose cold), the other from the middle of August to the latter part of September (autumnal catarrh). The disease occurs principally in neurotic individuals, and heredity exerts a marked influence in its production. Males are more likely to be sufferers than females, in the proportion of three males to two females. The diseases incident to childhood, it is thought, cause a predisposing state of the system to all affections in which a neurotic element plays an important part. It is remarkable that this disease is almost wholly confined to persons of education and fair social position; and that those who live in cities, and whose occupations are sedentary, are more liable than are residents of the country. The disease is more common in youth and middle age, comparatively few being attacked for the first time after forty years of age.

The attack may be precipitated by only *one* of the various irritants, or by every one, if there be an abnormal condition of the inherited or functional activity of the nerve-centres; it may be provoked by the irritant whenever applied, regardless of the season; sudden changes in the temperature favor the accession of the disease; the exciting cause will be most potent through physical or mental over-exertion or emotional excitement, and by direct or reflex irritation of the sensitive areas of the nasal mucous membrane, of which there may be one or more in the same nostril. The pollen of the various kinds of grasses, meadow-foxtail, and golden rod, are regarded as especially active, besides the pollen of roses, wheat, rye, oats, Indian corn and barley. The most prevalent form of the disease in this country (the autumnal form) begins about the latter part of August and lasts until the inception of frost. This variety is due to the active dispersion of the pollen of rag-weed at this particular time. In susceptible individuals any form of dust coming in contact with the sensitive nasal mucous membrane may induce this disease.

This disease is associated, in a large number of cases, with some abnormal condition of the intranasal structures. Among these abnormalities and morbid conditions may be enumerated hypertrophic rhinitis; deviations of, or outgrowths from, the nasal septum; mucous polypi; enlargement of the inferior or middle turbinated bodies, and peculiarly sensitive areas.

Symptoms.—The premonitory symptoms vary considerably with the individual. A common symptom is pain and tension about the forehead, pain in the eyeballs and itching at inner canthi, and sometimes photophobia. Others complain of tingling and itching sensation in the roof of the mouth, pharynx, and end of the nose, accompanied by most inordinate sneezing. After a few days the symptoms increase in severity. There is perversion of the olfactory function and tinnitus aurium; epistaxis; obstruction of nostrils, with discharge of limpid mucus. Sometimes one nostril is stopped, then the other, often both, being influenced by position and frequently being rapidly relieved by active exercise. Frequently the patient complains of itching of the skin of the scalp, chest, and shoulders, and urticaria is often met with. When the attack is prolonged there is generally more or less mental and physical depression.

In those persons who have had several previous attacks the catarrhal symptoms in the lower respiratory tract are followed by an expectoration of masses quite viscid in character: and later, asthma is developed, which is sometimes quite severe and long-continued. When asthma is a marked feature in the individual case, it overshadows all the other symptoms. When the asthmatic condition persists after the disappearance of the coryzal symptoms, and the period of this persistence tends to lengthen every year, the patient may develop into a confirmed asthmatic, and be subject to attacks throughout the year.

There is a gradual subsidence of the symptoms after three or four weeks, when the disease assumes a more or less remittent character. The severity and duration of the attack vary in different individuals, and to some extent in the same individual in successive years.

Persons suffering from this disease may, if circumstances permit, secure freedom from liability by departure to some probable exempt locality. A sea-voyage is the most certain means of escaping, but a change to the seaside, where the prevailing winds are from the sea, will generally give relief. If a change of residence is impossible during the hay fever season the patient should avoid being out of doors during the hottest part of the day and when the wind is high, to avoid the aggravating influences of light, heat, and dust. When out of doors patients are compelled to wear respirators or plug the nostrils with cotton wool, and to wear spectacles with gauze guards to prevent the pollen from coming in contact with the membrane.

The scientific treatment consists in the careful interpretation of the various symptoms and the proper comprehension of the preponderance of the causes. As the predisponents are of greater importance than the excitants in the majority of cases, the neurotic condition should receive first attention.

Innumerable local remedies have been employed for direct application to the nasal passages in this affection, but their very number asserts their uselessness in the vast majority of cases. In acute affections of the mucous membranes Cocaine is often a most useful agent, but it is too indiscriminately and injudiciously employed. Its long-continued use in the nose and throat induces an increased irritability of these structures by repeatedly bringing into play the contractile power of the smaller vessels and erectile tissues, which ultimately results in permanent dilatation of the erectile cells.

Deviations of the septum, spurs, mucous polypi, and other abnormalities should be removed, while redundant tissue, erectile or otherwise, and hyperæsthetic areas, should be carefully cauterized by the galvano-cautery. In employing the galvano-cautery for the destruction of the terminal filaments of the sensitive nerves, great care must be taken to include only that portion in the operation which has been found, by previous examination with a probe, to be most sensitive to irritation. The membrane should be merely seared by the flat cautery-knife, which is heated to a dull cherry red. This treatment may be undertaken during an attack, but it is best prosecuted during the interval of freedom. If treatment be suspended upon the termination of symptoms, the paroxysms will return again and again; but if it be persisted in, the attacks will be less severe and the intervals between the paroxysms will be longer, until finally they cease altogether.

The indicated remedy in conjunction with moderate exercise, massage, daily baths, and electricity will produce good results.

Arsenicum iodatum is the nearest to a specific for hay fever that we now possess. It acts magically, sometimes arresting the attack in a few hours (Hale).

Naphthaline has been found a valuable remedy for hay fever, many inveterate cases seeming to have been entirely arrested; sneezing, eyes inflamed and painful, head hot; also spasmodic bronchitis and asthma, relieved in open air, with soreness in chest and stomach (Allen).

Arsenicum album is a leading remedy. With fever, prostration, and other characteristic symptoms.

Aralia racemosa.—Extreme sensitiveness to a draft, the least *current* of air causing sneezing, with copious watery, excoriating discharge from nostrils and posterior nares, of a salty, acrid taste. Dry, wheezing respiration, with sense of impending suffocation, and rapidly increasing dyspnœa.

Sabadilla.—Rose cold or hay fever, with burning and stinging, itching and tingling in nose, which is swollen ; watery discharge from nose and eyes.

Sticta pulmonaria.—Hay fever, incessant sneezing, with fullness in forehead and root of the nose, with tingling.

Ranunculus bulbosus.—Tingling and crawling in the nostril ; nose feels stuffed, aggravated towards evening ; pressure at root of nose ; smarting and burning in the eyes.

Sinapis nigra.—Acrid nasal discharge, sneezing and lachrymation. Rattling wheezing in chest and difficult breathing.

ANOSMIA.

Anosmia, loss or deficiency of the sense of smell, may be due to conditions of the nasal cavity, which cause an interference with its physiological integrity, or to disease of the cerebral centres, or injury of the olfactory nerve. Most commonly it is a symptom of chronic inflammatory affections of the nose, whether hypertrophic or atrophic, and of syphilis. The presence of polypi, rhinal calculi, fibromata, hypertrophy of the middle turbinated body, and deviated septum, by producing stenosis, interferes with the function of smell. Anterior obstructions may interfere with the sense of smell ; if the posterior nares be obstructed the patient may be able to smell, but the sense of taste will be deficient. Diseased conditions of the fifth and seventh nerves may cause anosmia, which is usually unilateral. Anosmia due to central disease is not common ; when present it is the result of compression of the anterior portion of the brain from tumors, abscesses, or exudations—hemorrhagic, serous, etc. The olfactory bulbs may be injured by concussion, as from a blow upon the head. Atrophy of the olfactory nerve may result from disease or the degenerative processes of old age. The function of the olfactory nerves may be injured by excessive stimulation from the inhalation of irritating chemical vapors, from the use of various kinds of snuffs, and the inordinate use of the nasal douche.

Inspection of the nose and nasopharynx is necessary to differentiate the various forms and causes of anosmia, and determine the olfactory power of the nostrils by separate tests. Odoriferous substances (not acrid or pungent odors) only should be used—oil of cinnamon, oil of peppermint, turpentine, and valerian.

The restoration of the function is dependent on the cause of the affection. If due to catarrhal processes recovery usually takes place if the disease has not existed two years or more. In cases due to the presence of polypi or other growths, the olfactory sense will in most cases be restored on the removal of the mechanical obstruction.

The symptom of dullness, diminution, or absence of smell is remarked under the following remedies: **Alumina, Causticum, Cyclamen, Hyoscyamus, Ipecacuanha, Magnesia muriatica, Mezereum, Natrum muriaticum, Phellandrium, Plumbum, Rhododendron, Silica, Sulphur, Tabacum, Zincum.**

PAROSMIA.

Perversion of the sense of smell may be due to intracranial causes, as inflammatory and degenerative processes of the brain or olfactory lobes; tumors or exudations in the forepart of the cerebrum or in the region of the olfactory nucleus. The olfactory hallucination occurs with the insane, with those who are hypochondrical and hysterical, and is a frequent accompaniment of the epileptic attack. It may result from post-influenzal or climacteric neurosis. In all cases there is a functional morbid condition of the nervous system.

Occasionally the subjective sensations of smell are of sufficient intensity to cause the patient to seek medical relief even where the mental condition is normal and there is an absence in the nasal cavities of any visible pathological lesion. Patients will complain of a fetid, putrid, nauseous, sour or other peculiar smells, and will be so inconvenienced thereby as to feel obliged to isolate themselves from all society.

Treatment should be directed to the general condition of the patient and the application of local measures when necessary.

The following-named remedies present illusory or imaginary smells: **Anacardium, Arsenicum, Aurum, Belladonna, Calcarea carbonica, Graphites, Kreosotum, Mercurius solubilis, Nitrum acidum, Nux vomica, Phosphorus, Pulsatilla.**

EPISTAXIS.

(SYNONYMS: *Hemorrhagia Narium; Rhinorrhagia.*)

Epistaxis, or nosebleed, is one of the most common varieties of local hemorrhage, owing to the large distribution of blood-vessels throughout the nasal cavities. The flow is generally from one nostril, and is very apt to recur. It is most frequent about the time of puberty, it often follows masturbation, and is frequently a form of vicarious menstruation. The most frequent local causes are due to direct violence, blows of any kind; the inhalation of irritating particles in the air, and the presence of fibrous tumors and malignant growths. Hemorrhage may take place from any part of the mucous membrane, but the most usual situation of the bleeding point can be located in the anterior part of the septum near the anterior palatine canal—a spot where ridges or spurs are frequently situated. The membrane is very apt to become attenuated by the growth of these spurs, and the slightest strain from blowing the nose, or by sneezing, will cause a hemorrhage. The ulcerative processes of syphilis, lupus, and lepra, and the forcible removal of crusts from erosions of the membrane will cause a free flow of blood.

When the hemorrhagic diathesis (or hæmophilia) is present the smallest wound or the least blow is sufficient to give rise to the most serious hemorrhage. Epistaxis is apt to occur in all anæmic conditions of the system; and in plethoric children it is not infrequent, often giving relief to the sense of fullness in the head. Epistaxis is not an uncommon symptom in eruptive and relapsing fevers, in scurvy, in acute yellow atrophy of the liver, and in phosphorous poisoning. In elderly people bleeding from the nose is due to atheromatous changes in the blood-vessels; in syphilis, phthisis, and alcoholism the bleeding is due to diseased state of the vessels. Emotional excitement will produce hemorrhage from the nose; violent coughing or retching, and continued severe exertion of any kind will cause like result as the effect of strain on the vascular system. When the bleeding is vicarious, taking the place of hemorrhoidal or catamenial discharge, it is generally periodical. Epistaxis is sometimes hereditary.

Thorough rhinoscopic examination of both nostrils and the nasopharynx is of paramount importance in the treatment of every case of epistaxis. If epistaxis follows as the result of a fall or blow upon the head it may be a symptom of fracture of the base of the skull.

The **prognosis** depends entirely on the constitutional condition of the patient, the quantity of blood lost, and the effects that its loss may have produced.

If the hemorrhage be due to a general constitutional disease, remedies to correct that condition should be administered; but if it takes place vicariously of natural discharges, efforts should be made to restore those functions which have been impaired. Vicarious hemorrhages should not be interfered with unless the flow be so excessive as to jeopardize the life of the patient. Slight bleeding may be disregarded, as the tendency is to spontaneous arrest. If the bleeding should not cease spontaneously, the simple expedient of placing the patient in a prone position and making pressure over the source of the hemorrhage may prove effectual. If the patient be standing or sitting the head should *not* be flexed, but rather extended. Cold applications to the nose, internal and external, or to adjacent parts, are often serviceable. Avoid the use of astringents, as they damage the membrane and often produce anosmia. The bleeding which follows operations in the nose can usually be checked by packing the nostril with pledgets of cotton soaked in cocaine, four per cent. solution, or with styptic as recommended in formula 7. When there is ulceration at the anterior part of the septum the use of the galvano-cautery will promote cicatrization. Generally the most effectual method of controlling the hemorrhage is by pressure, which is effected by pushing small strips of lint into the nose until the nostril is completely filled. Posterior plugging, by means of Bellocq's apparatus, should not be employed until other measures have proven unsuccessful, as this method is not free from danger.

Calcarea carbonica.—Inclination to nosebleed in fat children.

Aconite—Hemorrhage of bright hot blood, with anxiety. Great sensibility of olfactory nerves. (Belladonna.)

Bryonia.—Bleeding from suppressed menstruation; in the morning after rising.

Belladonna.—Congestion to the head; worse from motion, noises, and bright light.

Millefolium.—Bright red blood, after mechanical injuries.

Carbo vegetabilis.—Recurring nosebleed in persons who have been overtaxed with anxiety, especially elderly persons; copious passive hemorrhage.

China.—Nosebleed in anæmic persons, with ringing in ears.

Hamamelis.—Nosebleed either vicarious or idiopathic, with tightness in bridge of the nose, and crowding pressure in forehead between the eyes.

Arnica.—After external injury.

Nux vomica.—Congestion to the head; pain in forehead; constipation; suppressed hemorrhoidal flow.

Pulsatilla.—Vicarious menstruation.

Phosphorous.—The hemorrhagic diathesis; the blood does not coagulate.

FOREIGN BODIES IN THE NASAL PASSAGES.

It is not an uncommon occurrence to find that children, and insane persons, have put buttons, peas, beans, cherry-stones, beads, etc., into their noses, their most frequent lodgment being in the lower and anterior portion of the nasal cavity; sometimes they may be found farther back, being wedged in between the middle turbinated bone and the septum. Sometimes particles of food or hard substances—such as fruit-stones—may be forced into the posterior nares in the act of choking or vomiting.

By reason of the irritation and sneezing produced by the foreign body it may be spontaneously expelled. In some instances the presence of the foreign body attracts no attention, and it may be retained within the nasal cavity for years, causing a chronic inflammation and ultimately an extremely fetid discharge. Commonly a foreign body speedily causes an ulcerative process of the mucous membrane, with intense pain in the forehead and cheek, neuralgic in character, paroxysms of sneezing, anosmia, and difficulty in hearing, due to obstruction of the Eustachian tubes.

To make a correct diagnosis the nasal cavity should be cleared of all secretion; if tumefaction be present it may be overcome by the application of a four per cent. solution of cocaine. Hard substances are often encrusted with calcareous deposit, and may be mistaken for rhinoliths; vegetable substances sometimes swell considerably, and may even germinate in the nose.

The removal of a foreign body is occasionally very perplexing. Restless, vexatious children will sometimes require to be anæsthetized, when with an ear curette, or a pair of delicate forceps, the offending substance may be withdrawn. If the foreign body be deep-seated, pass a slender wire (doubled) along the floor of the nose back to the pharynx, withdrawing the loop out of the mouth with forceps. Secure to the wire loop a tampon of gauze or cotton, draw it into the posterior nares. and pull it through the nasal cavity, which will usually effect the dislodgment of the foreign body.

RHINOLITHS.

Rhinoliths—calcareous concretions—are sometimes found in the nose after chronic inflammation of the mucous membrane. They are usually formed by the deposition of the nasal secretion about foreign bodies as a nucleus. They consist of mucus and phosphate of lime.

The symptoms resemble those described as being produced by foreign bodies, but as the calculus increases in size it causes more annoyance. A fetid discharge, nasal obstruction, and headache are usually present. The shape is generally oval and the size varies greatly. The surface may be smooth, but as a rule it is a little rough and the color grayish-black.

A calculus may be mistaken for an osteoma, necrosed bone, or cancer. If the calculus is movable, or if its surface is capable of penetration by a needle, it can be distinguished from an osteoma. From necrosed bone it may be known by the absence of the horrible odor. The slow course of the disease and absence from pain distinguish it from cancer.

An ordinary polypus-forceps is usually sufficient to remove the calculus, but if it is very large it should be crushed with a lithotrite and removed in fragments. It some cases it may be most advantageous to push it back into the nasopharynx.

PARASITES IN THE NOSE.

As this affection is seldom seen except in tropical countries, it will receive but passing notice. The larvæ of the common house-fly are deposited in the nostrils of the victim while asleep, and the rapidity of their evolution into maggots is extraordinary. Centipedes, caterpillars, leeches, earwigs, etc., have been known to invade the nasal passages.

Inhalations of chloroform effect their prompt destruction.

THE ACCESSORY CAVITIES.

ANTRUM OF HIGHMORE.

The Antrum of Highmore, or maxillary sinus — the largest of the air-cells — lies between the orbital plate and the molar teeth, and communicates with the middle meatus of the nose. It is lined with a prolongation of the nasal mucous membrane. As a complication of acute rhinitis, this cavity may be involved in the inflammatory process, which usually disappears on the subsidence of the nasal symptoms.

Suppuration or empyema of the antrum results, in the majority of cases, from dental caries or alveolar abscess. It may be caused by injuries of the superior maxillary bone, syphilitic disease of the nose, and malignant growths. Hypertrophic rhinitis and nasal polypi, by producing stenosis of the ostium maxillare, frequently cause a suppurative inflammation of the antrum. It may also be caused by scarlet fever, typhoid fever, erysipelas, diphtheria, glanders, and influenza.

Symptoms.—If the ostium maxillare be open there will be a thin, purulent discharge from under the anterior extremity of the middle turbinated body, pale lemon-yellow in color. The discharge flows intermittently, and occasionally pulsates; it is offensive, and the patient is aware of it, thus contrasting with atrophic rhinitis, where the afflicted one is not cognizant of the fetor but his friends are. Frequently the only manifest and particularly diagnostic symptom is the discharge of pus, which is unilateral, except in cases where both antra are affected. The middle turbinated body is usually swollen, while on the surface of the inferior turbinated body and the floor of the nose may be seen some creamy-looking pus.

The symptoms are much more positive if the ostium is closed: there is a dull aching or throbbing pain in the cheek, with heat, redness, and fullness of the soft parts externally, and a neuralgic pain in the frontal and supraorbital regions. The teeth on the affected side feel as if elongated, and mastication is painful. The pain is not marked in the region of the cheek and upper teeth. If the pus is retained it may cause distension of the osseous walls and displacement of the eyeball by pressure against the floor of the orbit.

Ocular examination will reveal a swollen and congested condition of the mucous membrane, and sometimes polypoid excrescences or hypertrophies in the region of the middle meatus. To facilitate the examination it may be desirable to make an application of cocaine to reduce the general turgescence of the tissues. The purulent secretion should be wiped away, and the patient directed to incline the head forward, with the affected side upwards. Examine again, and if pus presents wipe it away and repeat the process. If the same result follows several repetitions, the diagnosis of antral empyema is probably correct. If pus is not manifest anteriorly, posterior rhinoscopy must be employed to determine if the discharge drains backwards. The subjective symptom of foul taste due to the flowing into the mouth of the fetid secretion will aid in the diagnosis.

In some instances the transilluminative method proves a valuable aid in diagnosis, while in other cases it is disappointing and misleading. While the patient is in a perfectly dark room a small electric lamp is placed within his mouth, his lips being firmly closed, the outlines of the antrum can sometimes be mapped out. If there be pus in the antrum, that side of the face will appear darker ; but sometimes the presence of a small amount of pus can not be distinguished, and will not cause any perceptible difference in the illumination of the two sides of the face.

As complications of this affection secondary empyema of the other sinuses, caries, and inflammation of the eye and cheek may occur.

Treatment.—When pus has formed, all carious teeth in the maxilla involved should be extracted, and if pus is discharged from the cavity, the opening should be enlarged sufficiently to give free exit to the pus in the antrum. If there is no carious tooth, and it is impracticable to approach the antrum from the nasal cavity, perforate the antrum by extracting the first permanent molar tooth, and pass a drill or trocar into the cavity through its socket ; the index finger should be extended on the shaft of the instrument as a guard, and then pressed forward with an even, rotating motion to avoid the sudden yielding of the wall of the antrum and the plunge of the instrument through the wall of the orbit. When the antrum is opened, wash it out thoroughly, once or twice daily, with a three per cent. solution of hydrogen peroxide, gradually increasing the strength of the solution if necessary. Clear warm water, or carbolic acid solutions are equally useful. The irrigating process should be discontinued as soon as the fluid syringed into the cavity comes away clear. In the interval between the washings an obturator, in the form of a plug fixed to a plate, is inserted into the opening to prevent the ingress of food.

When the teeth are in perfectly sound condition, the antrum may be punctured through the alveolus, thus insuring more perfect drainage and better results generally than by intranasal operations. Nasal polypi and hypertrophies in the vicinity of the middle meatus certainly demand treatment.

Cysts, polypi, fibromata, and epitheliomata have been met with in the antrum; the difficulty in diagnosis until external manifestations become apparent ultimately requires the employment of general surgical methods for their removal.

Empyema of the antrum may exist for a long time and not be recognized except by the careful observer. In all cases of purulent nasal discharge, therefore, it is very necessary to make a thorough examination.

FRONTAL SINUS.

The frontal cells or sinuses are situated between the two tables of the frontal bone, and are lined by a continuation of the nasal mucous membrane. Catarrhal inflammation of this sinus is frequently associated with simple rhinitis. The frontal headache which so frequently accompanies acute rhinitis is thought by McBride to be due to the swollen mucosa around the orifice of the naso-frontal duct, so cutting off the cavity from the external atmosphere. The contained air is soon absorbed, and the diminished atmospheric pressure gives rise to the disagreeable subjective phenomena. The pain is felt at the root of the nose, extending along the supra-orbital ridge, and becomes a general frontal headache.

Suppuration of the sinus undoubtedly occurs as the result of long closure of the infundibulum, from gonorrhœal infection, syphilis, and the development of mucous polypi, cysts, and other growths within the sinus. When the canal is impermeable and the pus is retained there will be persistent and severe pain, fever, and possibly cerebral symptoms. Bulging may occur at the inner angle of the orbit, in the superciliary region, or toward the cranial cavity. In course of time the abscess may burst spontaneously at the point of greatest distension. If there is free drainage of the inflammatory products into the nose, symptoms analogous to those of empyema of the antrum will be present. A chronic unilateral flow of yellow, fetid pus may be seen proceeding from the anterior part of the middle meatus; the irritating qualities of this pus may lead to hypertrophy of the mucosa and to polypoid growths.

Diagnosis.—As the antrum and the anterior ethmoidal cells open into the same region as the frontal sinus, a diagnosis can not be made from rhinoscopic appearances only. An important diagnostic sign is the tenderness and pain which will be elicted by pressure with the finger over the sinus at the upper and inner angle of the orbit. The pain in the forehead is also intensified by stooping, coughing, or blowing the nose.

Catarrhal inflammation of the frontal sinus due to temporary closure of the duct usually disappears on the subsidence of the acute inflammatory condition of the nasal mucous membrane.

Treatment.—In empyema of the frontal sinus the prime essential is to keep the naso-frontal duct open, and the establishment and maintenance of free drainage. To effect this object any coexisting chronic rhinitis should be treated, hypertrophic tissue on the middle turbinated body must be destroyed, and polypi removed. After the application of a ten per cent. solution of cocaine an attempt should be made to pass a slender knobbed probe into the sinus through the natural orifice; this probe should be bent at an angle of about 125° about one inch from the point, keeping it directed obliquely upwards and forwards until, with gentle manipulation, it passes into the frontal canal. This is a delicate operation, and not devoid of danger, as a false passage is easily made and the cranial cavity may be perforated.

The surgical method of reaching the frontal cells consists in making a transverse incision, down to the bone, from the root of the nose along the line of the eyebrow. The periosteum having been turned back, sufficient of the bony wall must be removed with the trephine, or chisel and mallet, to permit of thorough exploration of the interior of the sinus. The diseased conditions then encountered may be suitably treated, and after thorough irrigation the sinus should be packed with iodoform gauze. The wound should not be allowed to close until the sinus is in a perfectly healthy condition.

It is difficult to determine the presence of any of the various forms of neoplasms in the frontal sinus until distension, pain, deformity, etc., are produced.

ETHMOIDAL CELLS.

The lateral masses of the ethmoid bone are made up of irregular air-cells, surrounded by paper-like walls of bone, and are lined by nasal mucous membrane. The cells are divided into two sets—an anterior and a posterior. The cells of one set do not communicate with those of another. The anterior cells open into the middle meatus, just behind the orifice of the frontal sinus. The posterior cells communicate with the superior meatus.

These cells are commonly affected as a secondary result of nasal disease; they may also become involved as a sequel to inflammation of the orbit, or from the adjacent cavities. Necrosis of the ethmoid and the bones of the face occurs among workers in phosphorus. Suppurative ethmoiditis may result from syphilis and tuberculosis, and is frequently complicated by antral, orbital, or frontal abscess.

The pain, located at the root of the nose, increases in severity with the distension of the cells, and is then referred to the orbit, back of the eye, and to the frontal region. In the early stage the discharge of muco-pus is of a bright yellow color. Sometimes pressure on the eyeball causes the pus to flow more freely into the nose. If caries and necrosis take place the secretion becomes thicker and caseous, containing detritus. The pus burrows toward the point of least resistance—which is towards the orbit—and is sometimes followed by exophthalmus, orbital abscess, and even meningitis and death.

To differentiate suppurating ethmoiditis from antral or frontal abscess is often difficult. The disease can best be determined by observing the discharge of pus into the post-nasal space; pain at the root of the nose, at the back part of the eye, extending along the infra-orbital ridge; exophthalmus, and a narrowing of the field of vision.

The removal of polypi and reduction of hypertrophies, so that free drainage can be established, together with thorough cleansing of the nasal cavities may be the only treatment required in a certain number of cases. Suppurative ethmoiditis, with caries and necrosis, however, is a serious affection, because of the possible extension of the inflammation to the orbital and cranial cavities.

If surgical interference be found necessary, the employment of Max Schaefer's method is most serviceable. By the use of a delicate sharp gouge and curette he removes the cap, and in some instances the entire portion, of the middle turbinated body, and scrapes out the cavity; afterwards the cavity is thoroughly irrigated.

SPHENOIDAL SINUS.

The sphenoidal cells are air-cavities in the body of the sphenoid. Like the other air-cells in the bones of the skull they are not developed in young subjects. The air is admitted to them from the upper meatus of the nose through an opening in the front wall of each sinus, and they are lined with nasal mucous membrane.

Catarrhal inflammation of these cavities may be acute or chronic in character, and is usually secondary to a rhinitis or a naso-pharyngitis, or extension of the inflammation from one of the other accessory cavities—particularly the ethmoid, the posterior cells of which are contiguous to the sphenoidal cells. The pain is described as being in the middle of the head, radiating to the neck and occiput. From the position of the cavity it is often impossible to confirm a diseased condition of this sinus without removing a large portion of the middle turbinal. In the vault of the pharynx pus will be seen, which flows down into the nasopharynx, rarely finding its way into the superior meatus. The discharge may be precursory, and possibly excitant, cause of catarrhal inflammation of the nasopharynx.

The operation of opening this cavity is attended with great danger, and should only be done by a skilled operator.

Aurum, Nitric acid, and **Kali iodatum** are excellent remedies when the patient is syphilitic.

Mezereum will mitigate, and often arrest, the intolerable burning pain which is present, particularly at night.

Spigelia.—Swelling in region of the antrum, with darting and tearing pains, accompanied with burning.

Mercurius solubilis.—Pain is darting and tearing, extending to the ears, particularly unbearable at night. The head is hot; the mouth is sore; the gums are swollen and spongy.

Phosphorus.—Burning and throbbing in the region of the antrum, and a continual dull, aching pain in the molars, with jerking and tearing.

Staphisagria and **Teucrium** may also prove serviceable, particularly if there is any unnatural bone formation.

Kali iodatum.—Cartarrh of frontal sinus; coryza; pressive pain at root of nose; great fever. If this remedy fails, give **Iodine.**

Mercurius iodatus flavus.—Catarrh of frontal sinus, with offensive discharge from nose, and dull, boring, pressing pains over eyes, with bursting sensation.

Arsenicum, Asafœtida, Belladonna, Calcarea carbonica, Hepar sulphuris, Lycopodium, Phosphoric acid, Silica, should be administered according to presenting symptoms.

NASO-PHARYNGEAL CAVITY.

ACUTE NASO-PHARYNGEAL, OR POST-NASAL, CATARRH.

Inflammation of the lining membrane of the nasopharynx may be acute, subacute, or chronic, the chronic form being most common. Acute post-nasal catarrh may occur concurrently with acute rhinitis, being referable to the same causes, and it is a frequent accompaniment of acute pharyngitis. The symptoms of acute rhinitis often precede the eruptive diseases (especially measles), or may occur coincidently with the exanthem, or may follow the disappearance of the latter. This catarrhal condition may completely disappear, but in many instances it goes on to a chronic state, localizing itself in the naso-pharyngeal space, producing hyperplastic conditions of the adenoid tissue.

Medical aid is seldom sought for in cases of acute rhinitis and concomitant conditions, many persons favoring the idea that such an ephemeral affection does not require treatment.

When acute posterior naso-pharyngitis occurs in combination with acute rhinitis, the former is likely to be disregarded on account of the preponderant symptoms of the latter—obstruction to breathing and copious secretion. The usual symptoms are a dry, parched condition of the mucous membrane, causing a feeling of contraction on swallowing. This is soon followed by a discharge, albuminous in character, in a short time becoming thicker and finally purulent. Nasal intonation of the voice; pain at the top of the head; difficulty in hearing through involvement of the mucous membrane lining the Eustachian tubes, are additional subjective symptoms.

Treatment.—The nasopharynx should be cleansed with solution, formula 1 or 2, using post-nasal syringe. If the secretion is profuse, an application to the parts of Tannic acid, ten to sixty grains; glycerine, one ounce, will cause a contraction of the superficial blood-vessels and shrinking of the glandular tissue.

The process of resolution from an inflammatory state is very slow in the nasopharynx, which is so abundantly supplied with glandular elements; therefore, in the majority of cases, the acute condition lapses almost imperceptibly into the chronic condition. Repeated attacks of acute naso-pharyngitis; the presence of spurs, hypertrophies, septal deviations and outgrowths; and in some persons the immoderate use of alcohol and tobacco, induce

CHRONIC NASO-PHARYNGITIS.

(SYNONYMS: *Chronic Naso-pharyngeal, or Post-nasal, Catarrh.*)

This is a very common and wide-spread affection, is met with at all periods of life, and is mainly dependent, apparently, on climatic influences. "In those countries where extremes of temperature follow each other in rapid succession, where the thermometrical and barometrical fluctuations are most sudden and occur with the greatest frequency, and where the material composition of the atmosphere is continually changing, catarrhal affections of the naso-pharyngeal tract are most frequently met with. The appearance of the disease seems to depend not so much upon the degree of heat or cold as upon the rapidity and intensity of the change from the one to the other."* Certain trades or vocations originate a vulnerable condition of the upper respiratory tract, *e. g.*, those who labor in chemical works, or in overheated rooms, with insanitary atmosphere; tobacconists, millers, furriers, workers in woolen goods, etc. "All influences which impair the general health, interfere with the proper circulation, or impair the constituents of the blood, retard the processes of digestion and assimilation of food, or beget a hypersensitive condition of the vaso-motor nervous system, react upon the upper respiratory tract, in common with the other organs of the economy, and predispose, other things being equal, to catarrhal inflammation of the same. Over-indulgence of the appetites, excesses of all kinds, and habitual constipation predispose to the disease." It is especially liable to develop in persons of syphilitic, tuberculous. and rheumatic diathesis.

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*Dr. J. N. Mackenzie.

Symptoms.—The presence of an increased secretion of thick, tenacious mucus, starch-like or muco-purulent in character, causes irritation, obliging the patient to hawk in order to remove the collection. Sometimes the dribbling of this tenacious mucus into the lower pharynx will cause retching. After a time the secretion becomes thicker, and concrete scabs are deposited in the nasopharynx, which emit a foul taste and smell. The persistent effort to dislodge this mucus by hacking, coughing, and scraping, occasions a diffusion of the inflammatory process, eventually causing an augmentation of the soft palate and uvula, causing the latter to hang down on the base of the tongue, further increasing the general discomfort by nausea, hacking cough, etc. The persistency of the disagreeable sensation felt at the back part of the throat causes a dull aching pain in that region, and sometimes considerable pain is experienced in the occipital region. The Eustachian tubes are liable to be affected, and deafness and noises in the ears often arise from imperfect ventilation of the tympanum.

It is astonishing to note, however, that an inflammation capable of producing a certain train of symptoms will occasion such a vast degree of discomfort in one class of cases, while other individuals are tolerant of the condition to a degree of indifference. This variation of susceptibility is undoubtedly due to the nervous excitability and general condition of the patient.

Pathology.—The congestion of the early stage is followed by thickening and induration of the follicular elements of the mucous membrane. In some cases, where the disease has been of long continuance, the adenoid tissue and the glands of the mucous membrane gradually atrophy, causing the membrane to assume a thin, smooth, and shiny appearance, and the cavity of the nasopharynx to become more spacious.

Posterior rhinoscopic examination will disclose the muco-purulent accumulations which adhere tenaciously to the walls of the cavity. After the removal of the secretion the mucous membrane will present a congested appearance, which after a time disappears; then the raised, cushion-like masses can be seen on the sides and posterior wall of the nasopharynx. In advanced cases, where the glandular elements have undergone atrophy, the secretions tend to dry and the nasopharynx presents a dry, glistening surface, the same condition extending to the lower pharynx. Granulations, and frequently dilated tortuous veins, are seen in the oro-pharynx. In some instances the diseased condition extends to the larynx.

Prognosis.—In young persons and in recent cases a cure can generally be effected. In cases of many years' standing the possibility of cure is doubtful because of the anatomical changes in the parts. In all cases, however, the symptoms can be greatly relieved by persistent local and internal treatment.

Treatment.—As the naso-pharyngeal affection may be dependent upon and subordinate to nasal stenosis, the nares should in all cases be rendered permeable. When the disease is due to hypertrophy of the pharyngeal tonsil, the excess of tissue may be removed with suitable forceps or a Gottstein's curette.

Local treatment is of great importance. The nasopharynx should be systematically cleansed, two or three times daily at first, and at longer intervals afterwards. The secretion is best removed with the post-nasal syringe; if this instrument is impracticable, the patient may employ the douche or the hand-ball atomizer, using solutions of formulæ 1 or 2. When the mucous membrane presents a more or less granular appearance, with or without congestion, the application of iodo-glycerine solution (formula 9) will be found beneficial. In some cases the application of silver nitrate, varying in strength from ten to sixty grains to the ounce, will be found helpful. If the parts have a tendency to dryness, the application of Eucalyptol and Benzoinol, twenty grains to the ounce, or Pine-Needle oil and Benzoinol, twenty grains to the ounce, by means of an atomizer through the nares, will be useful.

Antimonium crudum.—Stoppage of nose. Sore, cracked, and crusty nostrils. Must draw quantities of thick yellowish mucus from posterior nares into the throat. Rawness of the palate. Patient is extremely irritable, fretful, and peevish.

Aurum metallicum.—Thick albuminous discharge from posterior nares in morning. Burning, itching, sticking and smarting; feeling of soreness in nose, especially when touched. Crusts in nostrils, as from ulcers. Caries of nasal bones; fetid, purulent, bloody discharge.

Hydrastis canadensis.—Hawking of yellow, tenacious mucus from posterior nares and fauces. Discharge of thick yellow-greenish, offensive matter from nose. Nasal discharge may be watery and excoriating, with burning and rawness of the throat.

Kali bichromicum.—Tough, ropy discharge from posterior nares. Nose is always full of thick mucus. Formation of tough, green masses, hard plugs, or "clinkers" in the nose, the detachment of which leaves very sore places; pressive pain at root of nose.

Kali carbonicum.—Stoppage and dryness of the nose; burning, without much discharge—when present it is tough, stringy, tenacious, hard to loosen. Obstruction of nose, with constant need to clear the throat. Nosebleed recurring always on washing the face, or in the morning.

Mercurius corrosivus.—Chronic naso-pharyngeal catarrh, especially if there is a thick, gluey discharge from the nose, associated with burning pain. Fluent coryza; swelling and redness of the nose; rawness, smarting in the nostrils.

Mercurius iodatus flavus.—Chronic naso-pharyngeal catarrh. Much mucus descends into the throat, causing hawking; constant inclination to swallow. Much tenacious mucus in throat, which is hawked up with great difficulty; hawking causes gagging. Tongue coated, thick yellow at the base.

Petroleum.—Dry feeling in the nose; obstruction of the posterior nares; adherent phlegm, blown out in small lumps; purulent discharge, and cracks in nostrils; hawking of a tough, disagreeably tasting discharge from the throat, in morning.

Consult **Sepia, Spigelia, Sticta pulmonaria, Sulphur, Thuja.**

HYPERTROPHY OF THE PHARYNGEAL TONSIL.

(SYNONYMS: *Adenoid Growths, or Vegetations, at the Vault of the Pharynx; Adenomata of the Pharynx.*)

The glandular tissue which exists normally between the orifices of the Eustachian tubes on either side in the vault of the pharynx resembles that of the faucial tonsils—lymphoid tissue—and was called by Luschka the "pharyngeal tonsil." It is also known as the "third tonsil." W. Meyer, of Copenhagen, was the first to estimate the clinical importance, and give a full description of, these growths, which he designated "Adenoid Vegetations." Hypertrophy of this tissue is most frequently found between the ages of three and fifteen or twenty, having a tendency to spontaneous atrophy after the age of puberty; yet it may persist or even make its first appearance in adult life. The affection is equally common in both sexes, and is often associated with enlargement of the faucial tonsils and the submaxillary glands.

Pathology.—The pharyngeal tonsil is an agmination of minute lymph glands. In a state of hypertrophy the round lymph cells contained in their reticular tissue increase in number, causing them to swell; there is also a similar infiltration of the intermediate tissue. Hypertrophy of this tissue has been called *Adenoid growths* from the fact that they consist of the lymphadenoid tissue of the mucous membrane in a state of exuberant proliferation.

Etiology.—Without doubt frequently repeated and perpetuated attacks of the inflammatory process that eventuates in thickening of the mucous membrane in naso-pharyngeal catarrh—which is almost always associated with chronic rhinitis—operate as an exciting cause of the hyperplasia, the resulting hypertrophy being due to the peculiar natural deficiency of recuperative power of lymphatic glandular tissue. Many observers regard diphtheria; scarlet fever, measles, and all conditions which predispose to catarrhal inflammation, as influential factors in the generation of this hypertrophic process, and this is because of the vital depression which follows these diseases. Heredity undoubtedly forms an important factor in the production of hypertrophied lymphoid tissue, as two or more children in the same family are commonly found to be similarly affected. The climate in this section unquestionably exerts a considerable influence in the production of the disease.

Symptoms.—In proportion to the amount of hypertrophy and the size of the nasopharynx the symptoms will vary. The nasopharynx, though comparatively small, is an important cavity because of its relation to the nose and the ears, through the Eustachian tubes. The leading symptoms are embarrassed nasal respiration and impairment of hearing. If the affection occurs in the nursing infant feeding is difficult if not impossible, because the child can not suckle and breathe at the same time, and malnutrition will result. The patient's mouth is constantly open, the palatine arch is narrowed, the bridge of the nose is flattened and widened, the inner canthi are drawn down, the alæ nasi are collapsed, the naso-labial fold disappears—all of which occasion a peculiar physiognomy and cause the countenance to acquire a stupid expression and a certain shade of sadness. The patient snores while asleep, and when awake the respiration is noisy, especially while eating or drinking. Impairment of hearing may result either from an extension of the catarrhal inflammation into the Eustachian tubes, or from hyperæmia which is set up in the middle ear by interference with the return circulation, owing to pressure exercised by the adenoid mass upon the pharyngeal veins and those of the deep-seated tissues. They are not infrequently the cause of recurrent otitis, especially in children who are poorly nourished or debilitated. There is inability to concentrate the attention ; there is derangement of sleep and temper, and loss of energy and spirits. The patient is inattentive to his surroundings, and is forgetful. Various morbid conditions of the pharynx, larynx, and bronchi, with their attendant symptoms, may also frequently be present. The voice is lacking in resonance and has a peculiar quality of thickness or deadness; certain consonants—*m*, *n*, and *r*—are imperfectly enunciated. Asthma, choreiform and epileptoid attacks, stammering and various disorders of speech, may be excited reflexly by the presence of adenoid growths. Incontinence of urine and torticollis have been observed to disappear after the removal of the pharyngeal tonsil. The copious secretion, which sometimes falls into the larynx, may cause attacks of laryngismus stridulus. Some patients feel obliged to make constant use of the handkerchief, the muco-purulent or purulent discharge frequently being of such an irritant nature as to cause eczema of the nostrils; other patients, again, complain of their inability to "blow the nose." The tendency to "catch cold" appears to be uncontrollable.

Rhinoscopically these growths will be found to be generally of a bright red color, on account of their vascular character, and vary in size from a cherry-pit to large nodular tumors blocking up the entire post-nasal space. In children they are usually of a soft consistency, resembling a cushion, presenting a smooth or irregular surface, frequently being larger on one side than on the other. In adults they sometimes have a dense, fibrous base, and are firmer in texture and less exuberant. When rhinoscopic examination is impracticable, as in young children, the vegetations can readily be felt by passing the index finger behind the soft palate into the naso-pharyngeal cavity. To protect the examining finger from being bitten, the child's right cheek may be pressed between its upper and lower teeth with the right index finger, while the left index finger is rapidly carried upwards behind the soft palate. The soft, boggy adenoid tissue, if present, can thus be readily recognized. These vegetations usually bleed when touched, and on withdrawal of the finger it may be smeared with blood.

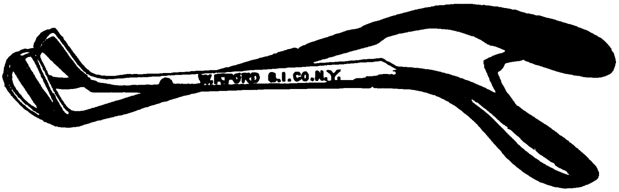
Diagnosis.—The entire upper respiratory tract should be carefully examined in all cases of adenoid hypertrophy. Enlargement of the faucial tonsils often coexists with adenoid vegetations, and commonly the oro pharynx is studded with lymphoid granules. Polypi and fibrous tumors of the naso-pharynx seldom make their appearance before the age of sixteen, and grow quite rapidly. Retro-pharyngeal abscess is attended with pain and dysphagia, and that there is tenderness on pressure is promptly manifested by the patient. The age of the patient and the symptoms caused by the presence of adenoid growths leave little room for doubt in the diagnosis after a thorough inspection of the nasopharynx.

Prognosis.—While, as above stated, there is a natural tendency for these vegetations to undergo atrophic changes at about the time of adolescence, suitable treatment should not be delayed until deafness and other serious conditions shall have become irremediable. Children affected with adenoid vegetations are not only predisposed to inflammatory affections of the respiratory tract, but they are less able to cope with diseases in which these parts are implicated. Removal of the growths by operation is practically devoid of danger, the only contraindication being that of a history of hæmophilia and active inflammation of the adenoid tissue.

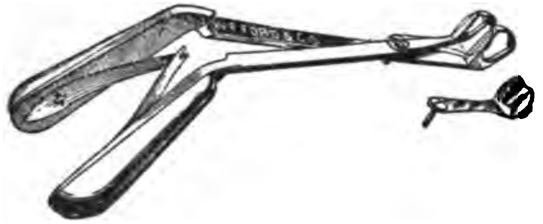
Treatment.—The most efficient management of each case depends wholly upon the symptoms presented, and the tendency to production of serious results averted. In certain cases of mild grades of hypertrophy of the pharyngeal tonsil, internal medication and local treatment will sometimes improve the catarrhal condition of the mucous membrane, and give some relief. Cleansing of the nasopharynx by means of the post-nasal syringe, spray, or atomizer, employing solution (formula 1 or 2), and the subsequent application to the post-nasal region of a forty-grain solution of tannic acid and glycerine one ounce by means of a suitably-curved applicator, three times weekly, will cause the tissues to contract and become less irritable and less vascular. If, however, the hypertrophied tissue is dense, compact, and sufficiently large to conflict with the legitimate function of the posterior nasal openings or the entrances to the Eustachian tubes, it is imperatively necessary to proceed to the destruction or removal of the growth with as little delay as possible.

Applications of chemical caustics are of doubtful value and are unsafe, because of the difficulty of limiting their action. The galvano-cautery is open to the same objection ; in addition it is a tedious method of treatment, and is liable to cause acute inflammation of the Eustachian tube. Scraping away of the vegetations with the finger-nail, or with an artificial finger-nail made of steel which is fitted on the forefinger, is an unsatisfactory method because of its very probable incompleteness.

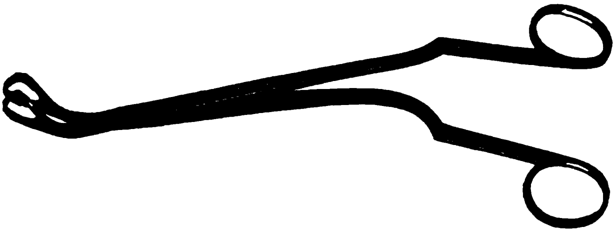
The most satisfactory results follow the complete extirpation of the hypertrophied tissue with Gradle's, Concanon's, or Nichols' forceps. Dr. Concanon has devised a guard which can be attached at the lock of the forceps; this guard acts as a palate retractor, facilitates introduction, and prevents injury to the posterior edge of the septum from the closing blades.



Gradle's Adenoid Forceps.



Concanon's Adenoid Forceps.



Nichols' Adenoid Forceps.

Anæsthetics.—It is doubtful if cocaine will produce satisfactory local anæsthesia, as the drug seldom reaches the parts which are to be removed in sufficient quantity to cause the desired result. The nitrous oxide, or laughing gas, is a very valuable agent for producing insensibility, being especially suitable for operations which are not prolonged beyond a few minutes. General anæsthesia, especially in young subjects, is especially advantageous in the lessening of nervous shock, and it enables the operator to do his work with much greater thoroughness than when the operation is done without its aid. No bad results, as a rule, follow its use, and children are much more willing to undergo subsequent manipulations, should they be necessary, than when the operation has been made while they were conscious. The anæsthesia may be begun with chloroform, and after a few whiffs it may be substituted by ether. The anæsthetic prepared according to Schleich's formula has been used in the Throat Department of the New York Ophthalmic Hospital for several years, and it is thought that the advantages connected with the use of these preparations consist in a more perfectly sustained action of the heart and of the respiratory centre; the patient becomes thoroughly conscious, with faculties intact, in a very short space of time.

FOR BRIEF ANÆSTHESIA.

Petrolic Ether	ʒ iv
Sulphuric Ether	℥ vi
Chloroform	℥ iss

FOR LONG ANÆSTHESIA.

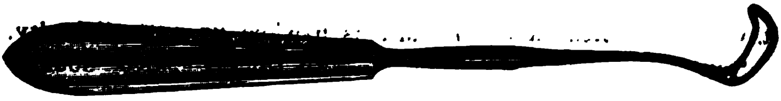
Petrolic Ether	ʒ iv
Sulphuric Ether	℥ v
Chloroform	℥ 1⅓

FOR VERY LONG ANÆSTHESIA.

Petrolic Ether	ʒ iv
Sulphuric Ether	℥ 2⅔
Chloroform	℥ i

The patient should be placed in the recumbent position, with the head slightly extended over the end of the table to facilitate the passage of blood through the nose and prevent it from entering the larynx. After placing a mouth-gag in position, the forcep is introduced behind the soft palate, closed, being guided, if necessary, by the index finger of the other hand.

Then, with the blades open, the growths are seized, and as rapidly as is consistent with thoroughness the exuberant proliferations are removed. Digital examination should be made to determine the completeness of the operation. The Gottstein curette may supplement the use of forceps for the removal of tags or shreds of tissue which have been left behind. Tonsillotomy should be included in the operation in cases where hypertrophy of the faucial tonsils exists. The operation is accompanied by a considerable flow of blood, but only in exceptional instances is the hemorrhage free; in but few cases has the operation ended fatally.



Gottstein curette.

Though the development of new lymphoid tissue is going on in some children all the time, in comparatively few instances is there any recurrence of the growths after a thorough removal under anæsthesia. Where the removal is incomplete, the remaining folds of adenoid tissue become engorged and increase in size to such an extent as to re-establish the condition of occlusion which the operation had temporarily overcome.

Baryta carbonica acts upon glandular structures particularly, and is useful in conditions of malnutrition in children where there is a tendency to slow degenerative changes. Discharge of thick yellow mucus from the nose; frequent bleeding followed by dryness. Takes cold easily. Is useful in hypertrophy of tonsils, enlarged lymphatic glands, and fatty tumors of neck.

Calcarea carbonica affects the lymphatics most prominently. Nose feels stopped, with sneezing. Offensive smell in nose. Clear, watery secretion; or purulent, fetid discharge, with swelling at root of nose.

Kali carbonicum.—Obstruction and dryness. Burning, without much discharge; the discharge, when present, is tenacious, tough, stringy, and hard to loosen. Same kind of secretion in pharynx; difficult to hawk it out.

Kali muriaticum.—Naso-pharyngeal catarrh, with swelling of the glands, and sore throat. Sneezing and profuse secretion of mucus (**Kali iodatum**). Vault of pharynx is covered with adherent crusts (**Kali bichromicum**).

Hepar sulphuris.—Mucus from posterior nares mixed with blood. Coryza, with inflamed swelling of the nose, which pains like a boil. Often indicated in follicular inflammation of the pharynx, with splinter-like pains and the general symptoms of the remedy.

Mercurius iodatus flavus.—Much tenacious mucus in the throat (**Kali bichromicum**). Mucus hawked up with difficulty. Chronic naso-pharyngeal catarrh, with thickly-coated, doughy tongue.

Mercurius iodatus ruber.—Whitish-yellow, or bloody discharge; affections of posterior nares, with raw sensation therein. Sensation of lump in the throat, with disposition to hawk it out.

DISEASES OF THE LINGUAL TONSIL.

The tongue is provided with numerous simple and compound follicular glands, which are most abundant on the posterior portion, from the circumvallate papillæ down to the root of the epiglottis, and from one faucial tonsil across to the other. This collection of lymphoid tissue, which constitutes what is termed the "lingual tonsil," is not only practically identical in structure with the faucial and pharyngeal tonsils, but is liable to diseased conditions similar to those which affect the tonsils proper. The existence of this adenoid tissue is a normal condition, and it is not discernible except when irritated; it may then assume the form of simple, lacunar, or phlegmonous inflammation.

A simple acute inflammation may occur as a primary affection, or it may develop in connection with an acute pharyngitis or faucial tonsillitis. There is more or less pain on swallowing, and a sensation of a foreign body, or a burning, pricking feeling in the throat. On examination with the laryngeal mirror the adenoid tissue is seen to be red and swollen; in some cases the swelling may be sufficient to come in contact with the epiglottis, which causes irritation and tickling, and induces coughing. Cough is often the most prominent symptom, and it may persist for an indefinite period. The other symptoms of the acute inflammation usually subside after two or three days.

In the second, or *lacunar variety* the pain and other symptoms are mainly dependent on the obstruction of the lacunæ at the base of the tongue. With the aid of the laryngeal mirror the characteristic manifestation in this form of inflammation may be readily seen in the formation of whitish deposits situated in and around the orifices of the lacunæ. All the symptoms are immediately relieved by the removal of the exudate.

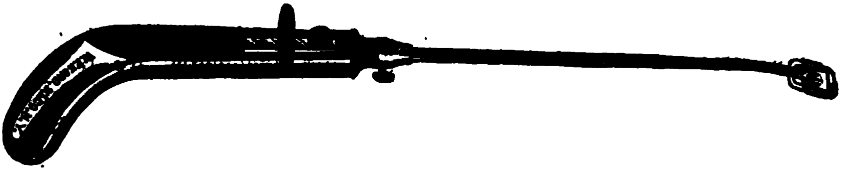
The **treatment** of these two varieties of acute inflammation of the lingual adenoid tissue is practically the same as that of similar conditions of the faucial tonsil.

Phlegmonous inflammation of the lingual adenoid tissue is comparatively rare. If the infiltration is diffuse, the whole tongue becomes swollen, odynphagia and dysphagia are present, and the glands of the neck are often implicated. To the touch the tongue has a hard, tense feeling, and later, on the formation of an abscess, the focus of pus can be distinctly felt. If the abscess opens spontaneously, or is lanced, there will be immediate improvement in the symptoms. In some instances the inflammation terminates in resolution, without the formation of abscess.

HYPERTROPHY OF THE LINGUAL TONSIL.

Though this affection may occur at any age, it is most frequently met with in adults between twenty-five and forty years of age, and is more commonly observed in women than in men. Adenoid hypertrophy at the base of the tongue is frequently seen in connection with dyspepsia and with chronic inflammatory conditions of the pharynx. The most important causes are apparently identical with those of hypertrophy of the faucial and pharyngeal lymphoid glandular masses, *viz.*, "the contamination of the buccal fluids by micro-organisms and their irritating chemical products—the result of their life processes—in association with rheumatic and other diatheses." (*Browne.*)

Symptoms.—The patient complains of a pricking, tickling, or burning sensation in the throat, or the constant feeling of a foreign body, as of a lump, skin, or hair, which conduces to a constant desire to clear the throat. The pain may be precisely localized by the patient to the region of the base of the tongue; in other cases the discomfort may be referred to the stomach, the larynx, or ears. There may be dysphonia (which is aggravated by singing and public speaking), aphonia, dyspnœa, and frequently loss of acuteness of taste. The cough is either violent, spasmodic, and almost incessant, or it may be of a hacking character, appearing at irregular intervals.



Myles' Guillotine for Lingual Tonsils.

On examination with the laryngeal mirror, the interval between the base of the tongue and the epiglottis may be seen to be more or less filled up with a mass of enlarged and protuberant glands, which in some cases may form an aggregation so large as to conceal the free edge of the epiglottis. In some cases the hypertrophy is more prominent upon one side than upon the other, or it may affect only an isolated portion, forming a raspberry-like tumor. In many instances there is a slight enlargement of the thyroid gland.

Treatment.—In simple cases—where the hypertrophied tissue is disseminated but not markedly protuberant — the galvano-cautery, using the flat electrode, is most effective. In more pronounced cases the redundant tissue may be most satisfactorily removed by means of the lingual tonsillotome.

Nitrate of silver, chromic acid, and other applications with caustic or astringent properties certainly benefit the condition when they are persistently employed.

THE PHARYNX.

ANATOMY.

The pharynx is a musculo-aponeurotic canal, about five inches in length, which extends from the base of the cranium to the upper border of the sixth cervical vertebra. Its transverse diameter is considerably greater than its antero-posterior diameter. Its widest part is opposite the laryngeal aperture, below which it rapidly contracts, like a funnel, towards its termination, where it is narrowest. At the lower border of the cricoid cartilage it becomes continuous with the œsophagus.

In describing the pharynx it may be conveniently divided into three portions: the superior, or nasopharynx; the middle, or oropharynx, and the inferior, or laryngopharynx. (The nasopharynx has been described in the Anatomy of previous Section.)

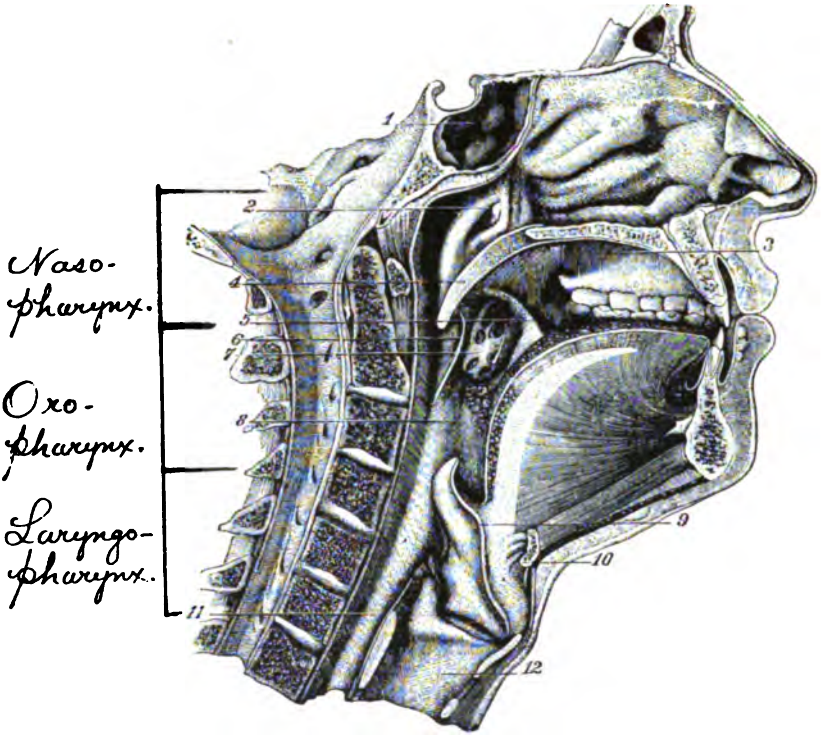
The oral portion, or oropharynx, is situated below the soft palate and above the level of the larynx. Owing to the mobility of its walls it is very variable in form and size. In front it communicates with the mouth through the isthmus of the fauces, and below this opening it is bounded anteriorly by the posterior part of the dorsum of the tongue. On its lateral wall there is a somewhat triangular recess bounded by two folds of mucous membrane, called the *anterior*, and *posterior*, *palatine arches*. Both these folds are connected above with the soft palate, and diverge as they pass downwards. The anterior pillar encloses the palato-glossus muscle, and descends to the side of the tongue; the posterior pillar encloses the palato-pharyngeus muscle, inclines backwards, and gradually disappears on the side wall of the pharynx. The space between the anterior arches of the palate, leading from the mouth to the pharynx, is called the "isthmus of the fauces."

The laryngopharynx extends from the greater cornua of the hyoid bone to the inferior border of the cricoid cartilage. Anteriorly it looks toward the epiglottis, and the superior aperture of the larynx is in the upper part of its anterior wall. On either side, at the posterior part, there is a small recess which presents a wide entrance, but rapidly narrows towards the bottom, termed the *sinus pyriformis;* in this little pocket foreign bodies that are introduced into the pharynx are most liable to be caught.

The walls of the pharynx are formed by a dense fascia—the pharyngeal aponeurosis—which is surrounded by muscles, and lined by a mucous membrane.

The principal muscles of the pharynx are the superior, middle, and inferior constrictors, and the stylo-pharyngei. The constrictor muscles are three flat sheets of muscular fibers which are so arranged that they overlap each other from below upwards. The superior constrictor has a wide origin from the sphenoid and palate bones, from the pterygo-maxillary ligament, and the base of the tongue. The middle constrictor is a fan-shaped muscle; it arises from the hyoid bone and the lower end of the stylo-hyoid ligament. The inferior constrictor, the most superficial and thickest of the three muscles of the pharynx, arises from the sides of the cricoid and thyroid cartilages. These muscles, meeting their fellows of the opposite side, are inserted posteriorly in the fibrous aponeurosis, which extends, in the median line, throughout the length of the pharynx. The pharyngeal aponeurosis maintains the integrity of the wall of the pharynx where the muscular fibers are absent, and it is the principal means by which the pharynx is attached to the base of the skull. The stylo-pharyngeus muscle arises from the base of the styloid process of the temporal bone, and passes between the superior and middle constrictors to be inserted into the pharyngeal aponeurosis and into the posterior border of the thyroid cartilage. The action of this muscle is to draw the larynx upward toward the base of the tongue, while the constrictors contract the lumen of the pharynx, so as to carry the morsel onward into the œsophagus.

The mucous membrane of the pharynx is continuous with all the openings into it; it is closely adherent to the underlying



Section in the median line of the face and the upper portion of the neck, designed to show the relations of the nasal fossæ and the mouth to the pharynx and larynx. 1, sphenoidal sinus; 2, internal orifice of the Eustachian tube; 3, palatine arch; 4, velum pendulum palati; 5, anterior pillar of the soft palate; 6, posterior pillar of the soft palate; 7, faucial tonsil; 8, oropharynx (the pharynx proper); 9, epiglottis; 10, section of the hyoid bone; 11, laryngopharynx; 12, cavity of the larynx.

tissues in its upper portion, but in the laryngeal region it becomes very lax. It is covered by columnar ciliated epithelium as low down as on a level with the floor of the nares; below that point the epithelium is of the squamous variety.

The pharyngeal glands are of two kinds: the tubular (mucus-secreting), and the lymphoid (lymph-secreting), glands. The mucous membrane is abundantly supplied with mucous glands, especially in the lower regions. The lymphoid and follicular glands are most numerous on the lateral and posterior surfaces of the pharynx.

The arterial blood supply is from branches of the external carotid. Its veins are branches of the internal maxillary, internal jugular, and inferior palatine.

Its numerous lymphatics are connected with the neighboring deep cervical glands.

The nerves of the pharynx are the fifth, glosso-pharyngeal, and branches from the pharyngeal plexus.

The *soft palate* (*velum pendulum palati*) is a movable curtain which intervenes between the buccal cavity and the pharynx. It is composed of a fold of mucous membrane between the two layers of which are interposed muscular, aponeurotic, and glandular structures, blood-vessels, and nerves. During deglutition it is drawn upwards and backwards, so as to completely separate the nasal from the oral portion. In front it is attached to the posterior margin of the hard palate; laterally it is connected with the sides of the pharynx; posteriorly it presents a free border, from the centre of which is a conical projection, called the uvula, which is composed of mucous membrane very rich in glands, and contains the azygos uvulæ muscles.

The muscles of the soft palate are the levator palati, tensor palati, palato-pharyngeus, palato-glossus, and azygos uvulæ. The levator palati arises from the under sufrace of the apex of the petrous portion of the temporal bone and from the under surface of the Eustachian tube, and is inserted into the soft palate by a broad expansion which meets that of its fellow muscle in the median line. The tensor palati arises from the scaphoid fossa at the base of the pterygoid process; also from the outer surface of the Eustachian tube. The tendon descends vertically to curve round the hamular process of the sphenoid bone, and then takes a horizontal direction to the palate bone, into which it is inserted by an expansion anterior to the levator.

The function of the levator palati is to raise the soft palate against the posterior wall of the pharynx, and the tensor palati makes the velum tense and unyielding as it is drawn upward and backward on each occasion of swallowing.

The azygos uvulæ consists of a pair of narrow muscular slips, placed parallel to and on each side of the median line of the soft palate. Each muscle arises from the posterior nasal spine of the palate bone, and is inserted into the uvula.

The palato-pharyngeus is placed behind the tonsil. It arises from the soft palate by two slips, which are separated by the levator palati muscle, and the fibers of which meet those of the opposite muscle in the median line. Passing obliquely downwards it joins the stylo-pharyngeus, with which it is inserted into the posterior border of the thyroid cartilage, some fibers being lost in the wall of the pharynx, others passing across the median line to interlace with those of the opposite side.

The palato-glossus is placed in front of the tonsil; it arises from the median line of the soft palate, in common with its fellow, and descends to the side of the tongue, where it is inserted, joining the fibers of the stylo-glossus and hyo-glossus muscles. The palato-glossus muscle is the constrictor of the fauces, and grasps the bolus of food when it has passed out of the mouth, thus preventing its return.

The tonsils (*tonsillæ amygdalæ*) are two pronounced oval glandular masses situated one on each side of the fauces, between the anterior and posterior palatine arches. The buccal surface of the tonsil is perforated by a varying number of orifices which lead into tubular or cleft-like crypts. The outside of the tonsil is in close relation with the superior constrictor muscle of the pharynx, external to which are the internal and external carotid and ascending palatine arteries, the internal jugular vein, and the eighth and ninth nerves.

ACUTE PHARYNGITIS.

(SYNONYMS: *Acute Sore Throat; Acute Pharyngeal Catarrh; Angina Catarrhalis Acuta.*)

Acute inflammation of the pharyngeal mucous membrane is common among people of all ranks and at all ages, though it is most frequently observed in young adults or children, and occurs most often in the spring, autumn, and winter, when sudden changes of temperature and inclement weather prevail.

Etiology.—The most frequent exciting cause is exposure to cold or drafts, particularly with those who live or labor in superheated rooms, breathing an insanitary atmosphere, and those affected with derangement of digestion, assimilation, and circulation. Persons of sedentary habits, with tendency to chronic constipation, and those who have poor food and are scantily clothed are especially susceptible. The acute febrile diseases, as scarlet fever, measles, rötheln, smallpox, and typhoid fever, are ushered in by acute pharyngeal inflammation. Catarrhal conditions of the naso-pharyngeal tract, hypertrophy of the faucial tonsils, obstructions in the nose—anything which necessitates mouth-breathing increases the vulnerability of the pharyngeal mucous membrane to inflammatory attacks. The scrofulous, rheumatic, and syphilitic diatheses predispose to the affection. The protracted use of certain drugs, as mercury, iodide of potassium, atropine, etc.; the excessive use of tobacco, alcohol, and too highly-seasoned food; overuse of the voice, especially in the night air—all operate in the causation of the disease.

Symptoms.—Usually there is a slight rise of temperature. In severe cases, and especially in children, there may be considerable fever, and the patient is generally depressed and complains of lassitude. The tongue is furred, stomach is deranged, bowels are constipated, and urine is high-colored; there is headache and pain in the neck and throughout the body generally. There is commonly a peculiar scratching and dry sensation in the throat, and deglutition may be slightly or intensely painful, according to the degree of inflammation. The inflammation is usually most intense in the vicinity of the palate and uvula, the latter often becoming œdematous and assumes a translucent appearance. The voice is thick, harsh, and nasal, but there is no vocal hoarseness unless the larynx be implicated. There may be radiating pains toward the ears, and impairment of hearing, due to extension of the inflammation along the Eustachian tube. In all cases the throat feels hot, dry, and rough, and there is a constant tormenting tendency to clear the throat of the mucous secretion, which increases in quantity after a day or two; afterward the discharge is ropy and tenacious, and finally muco-purulent.

The mucous membrane of the posterior pharynx, palate, and tonsils varies in color from a slight flush to a deep scarlet red, the lateral folds often being unusually prominent.

Pathology.—The distention of the superficial blood-vessels soon involves the mucosa; there is serous infiltration of the submucosa, and in the secretion will be found pus-corpuscles, epithelial cells, and micrococci.

Prognosis.—Simple catarrhal pharyngitis usually terminates favorably in from three to seven days, unless the inflammation extends to the larynx. Repeated attacks conduce to a weakening of the parts, thus prolonging the disease until a chronic condition is produced.

Treatment.—Prompt attention in the early stage of inflammatory affections is of infinitely greater value than any subsequent course of treatment. Strenuous efforts should be made toward the removal of the predisposing and exciting causes. The body should be uniformly covered with light-weight woolen underwear. The circulation can be stimulated by the daily douche of cold water, particularly over the spine. The avoidance of constipation is of paramount importance. Avoid sitting in badly ventilated or hot rooms, and drafts; also cold damp feet, and wet clothes. Sucking of ice, and cold compresses externally are of great utility in relieving the pain. Medicated mouth-washes are preferable to gargles. Rice-water, infusion of slippery elm bark, or flaxseed, are soothing beverages. For a few days the diet should consist of the animal broths, beef-tea, or milk.

Aconite.—Throat is sore, dry, and *burning red* (**Belladonna,** *dark red*). Raw and scraped feeling in pharynx, with burning and stinging pains, and constriction in soft palate and uvula. Throat is not swollen nor sensitive to external pressure, like **Belladonna.** Pricking, and scratching sensation, causing hawking.

Apis mellifica.—Constriction, with sensation of foreign body in pharynx, and dysphagia. Burning, stinging pains, extending to ears on swallowing. Œdematous uvula.

Argentum nitricum.—Excessive sticking pains on swallowing, as of a splinter (**Dolichos, Hepar sulphuris, Nitric acid**). Soreness, rawness, and intense redness, accompanied by accumulation of tenacious mucus.

Belladonna.—Useful in first stage. Throat feels raw, sore, and scraped. Pharynx looks deep red and shining, as if varnished. Throat swollen and constricted; feels as if too narrow when swallowing. Dryness, with painful and difficult swallowing (**Duboisia**).

Causticum is indicated in acute pharyngitis with laryngitis. Dryness, roughness, rawness, with collection of mucus which can only be raised after long coughing.

Kali carbonicum.—Acute pharyngeal catarrh, with constant desire to clear the throat; sharp sticking pains, aggravated by cold (**Hepar sulphuris**).

Mercurius solubilis. — Rawness, roughness, and stinging pains, aggravated by empty swallowing, at night, and in the cold air. Dryness and pressure in throat on swallowing, yet is obliged to swallow constantly because the mouth is always full of saliva.

Phytolacca.—Fauces congested and swollen; dryness, soreness, and roughness, with difficult swallowing, shooting through ears on attempting it.

SIMPLE CHRONIC CATARRHAL PHARYNGITIS.

(SYNONYMS: *Chronic Catarrh of the Throat; Chronic Sore Throat; Relaxed Throat.*)

This affection is most frequently the result of repeated attacks of acute pharyngitis, under which title the predisposing causes have been enumerated. Disturbances of the nervous and digestive systems, especially when associated with chronic constipation and hepatic torpidity, are frequent causes. Prolonged exposure to dry heat, or, in some cases, night air, or the vitiated atmosphere of crowded and overheated rooms, may give rise to it. Nasal stenosis, from whatever origin, and glandular hypertrophy in the nasopharynx, are common causes; in such cases the irritating secretions pass backward and drip into the pharynx, the unavoidable mouth-breathing still further aggravating the uncomfortable condition. The most severe cases result from the inordinate use of tobacco, alcohol, or irritating condiments; in such patients there is usually a coexisting gastric catarrh.

Recurrent attacks of the inflammatory process prevent the mucous membrane and underlying tissues from regaining their normal vigor and tension, but remain swollen, and finally become relaxed. The blood-vessels are dilated, and the submucous tissue is infiltrated and hypertrophied, the glandular elements participating in the same process. The character of the secretion is dependent upon the gravity and duration of the affection.

Symptoms.—The patient complains of a dry, parched feeling in the throat, especially in the morning; there is a sensation of constriction or foreign body, and a persistent desire to clear the throat. The voice is husky, easily fatigued, and often a hacking, irritable cough, with scanty expectoration of tenacious mucus. This inclination to clear the throat may become habitual, which habit should be distinguished from the cough arising from laryngeal or bronchial irritation.

Diagnosis.—The mucous membrane will be seen to be more or less generally congested and swollen, the velum palati, uvula, and posterior pillars being chiefly affected. Sometimes the posterior pillars are extremely thickened. The relaxed condition of the uvula is due to the infiltration of the mucous membrane and the submucous tissue, the size of the azygos uvulæ muscle being practically unchanged. In some cases the elongated uvula may cause little or no annoyance, but often it is the provoking cause of the irritable cough. In the greater number of cases the tonsils are implicated. The pharynx is usually covered with a transparent film of mucus. The collection of viscid material about the orifices of the Eustachian tubes, or the extension of the inflammation to the middle ear, causes impaired hearing.

Prognosis.—Chronic pharyngitis often persists during the lifetime of the individual, with occasional acute exacerbations. The cure is dependent upon the detection and removal of the cause, the adoption of suitable therapeutic measures, and the acquiescence of the patient to submit to an uninterrupted and extended treatment.

Treatment.—Gastric disturbances, constipation, and hepatic congestion demand prompt attention in the administration of the proper remedies and a properly regulated diet. Nasal and post-nasal obstructions should be removed, and the various exciting causes perseveringly avoided.

Before making any local applications, the parts should first be cleansed. In mild cases Alumnol (grs. xl. to water, ℥j.), used as a spray, or by swabbing the parts, will produce gratifying results. Or, chlorate of potash and alum, equal parts (grs. xv., water, ℥j.), as a gargle, will quickly relieve. A gargle of salt and warm water (half a teaspoonful to half a goblet) will be helpful. Also, chloride of zinc (grs. x—xx., water, ℥j.), applied with a cotton pledget. In advanced cases nitrate of silver (grs. xxx., water ℥j.), is most effectual; this can be best applied with a cotton pledget. After dipping it into the solution, be careful to press out, against the neck of the bottle, any excess of the solution, that not any may reach the larynx. These applications should be made once daily for a time, increasing the interval as improvement occurs; but the treatment, local and internal, should be continued during a protracted period.

Alumina.—Frequent clearing of the throat. Dryness, with sensation of tightly adhering phlegm which cannot be raised; continual dry hacking cough; uvula elongated. Rawness, hoarseness, irritability, relaxation, and a sharp splintery feeling in the throat, better from eating and drinking *warm things.*

Argentum metallicum.—Chronic catarrhal pharyngitis, with hawking of viscid and gray jelly-like mucus, aggravated in morning. Rawness, roughness, and soreness in throat.

Argentum nitricum.—Thick tenacious mucus in pharynx and nasopharynx, obliging hawking. Rawness, soreness, scraping in throat. Sensation of a splinter when swallowing or moving the neck. Catarrh of smokers, with sensation of a hair causing cough, which is again relieved by smoking.

Arum triphyllum.—Sore throat from overuse of voice; rawness, soreness, and constant hawking. Voice hoarse, uncertain, uncontrollable, changing continually.

Ammonium causticum.—Deep redness and burning rawness in throat, with aphonia and difficult respiration.

Cannabis indica.—Burning, roughness, scraping in mouth, throat, and larynx. Dryness, with thirst for cold water.

Capsicum.—Sore throat of smokers and drinkers; relaxed uvula; sore throat, with burning and constriction even when not swallowing.

Cistus.—Sore throat, with intolerable dryness, feeling as if glazed with strips of tough mucus; aggravated by cold air, relieved by swallowing liquids.

Coccus cacti.—Scraping, rawness, and constriction in throat. Sensation as if uvula was elongated, causing constant hawking. The thick viscid mucus is expectorated with the greatest difficulty, even with retching and vomiting (**Kali bichromicum**). Aggravation of symptoms in warmth, especially in bed (**Iodum, Mercurius**).

Ferrum phosphoricum.—Sore throats of singers and speakers; throat inflamed, dry, and painful. Catarrhal affections of the Eustachian tube and ears.

Hepar sulphuris calcareum.—Smarting, rawness, and scraping, with feeling as of a lump in throat, or sharp, splinter-like pains extending to the ear on swallowing (**Alumina, Argentum nitricum, Nitric acid**).

Hydrastis. — Hawking of yellow tenacious mucus from posterior nares and fauces. Burning, roughness, and rawness of throat. Pharynx is studded with deep red and very irritable enlarged follicles; aggravation from least exposure to cold.

Kali bichromicum.—Hawking of tough, ropy, tenacious, stringy discharge; throat is dry in morning, on waking, with painful swallowing. Useful in exudative stage of follicular pharyngitis. Sensation of a hair in the fauces; the tongue has a yellow coating at the base.

Kali carbonicum.—Tenacious, glairy mucus in pharynx, only loosened by much hawking. Sharp, sticking pains in pharynx, aggravated by cold (**Hepar sulphuris**). Swallowing difficult.

Natrum muriaticum.—Feeling of a plug, or great dryness in throat; uvula relaxed; muscles so weak "food goes down the wrong way." Enlarged follicles; constant hawking.

Nux vomica.—Rough, raw, scraped feeling in pharynx in smokers and drinkers. Rawness and scraping in the fauces, as after heartburn. Stitches into the ear when swallowing.

Phytolacca.—Pharynx dry, rough, and dark red; soreness and dryness; mucus hawked with difficulty from posterior nares; hangs down in strings; severe pains in head, neck, and back. Swallowing difficult, pains shooting through ears on attempting it; can not drink hot fluids; choking sensation.

Rumex.—Aching and excoriated feeling in pharynx, with sensation of a lump, not relieved by hawking. Collection of tough mucus in the fauces.

Sanguinaria.—Throat feels swollen, as if to suffocation, with pain on swallowing, and aphonia. Burning in pharynx, better when inspiring cold air; throat so dry it seems as if it would crack. Dryness, with teasing, hacking, tickling cough.

Kali chloricum.—Throat red and dry; rawness, scraping, and difficult swallowing. Especially useful when there is a great deal of fetor of the breath.

Æsculus hippocastanum.—Constriction, burning, dryness, excoriation, raw feeling, and stiffness in throat, causing disposition to hawk. Sallow face, slow digestion, constipation, and hemorrhoids.

Secale cornutum.—Dryness and burning of soft palate and pharynx, with hawking up of the follicular exudate.

Lachesis.—Spasmodic contraction of the throat, much inclination to swallow, although painful; worse on left side and after sleep; can not bear pressure about the neck.

Petroleum.—Throat feels dry, sore, swollen, and raw, with stinging extending into ear when swallowing. Hawking of a tough phlegm in morning.

Phosphorus.—Throat is very dry, fairly glistening. Burning in œsophagus, and sensation as of cotton in throat.

Wyethia.—Chronic pharyngitis; dryness, with constant desire to clear the throat. Granular pharyngitis; hot, burning feeling; enlarged follicles. Tendency to get hoarse from talking or singing (**Phosphorus**); the throat is hot and dry (**Belladonna**).

FOLLICULAR PHARYNGITIS.

(SYNONYMS: *Hypertrophic, Granular, Glandular Pharyngitis; Clergyman's, or Speaker's, Sore Throat.*)

This disease occurs most frequently in young and middle-aged persons. When seen in childhood it is usually associated with hypertrophy of the pharyngeal tonsil. The scrofulous and rheumatic diatheses are prominent predisposing factors, the patients invariably presenting evidences of anæmia or constitutional weakness.

Etiology.—Over-exertion or over-use of the voice, and faulty method of voice-production, are probably the most potent of all the exciting causes of this affection. It is manifested with greatest frequency in preachers, lawyers, singers, politicians, auctioneers, hucksters, etc., whose avocations require the voice to be used either excessively or under unfavorable circumstances—*e. g.*, when a catarrhal condition of the mucous membrane is present, or when the voice is used in a dusty or contaminated atmosphere, or in the open air amid great noise. Additional causes are exposure to cold, and continued mouth breathing, especially with those whose employment in factories and mills exposes them to the influences of irritating vapors or particles in the atmosphere. It is a frequent attendant upon gastric disorders. Oftentimes the etiology can not be determined.

Symptoms.—At the outset of the disease there is a sensation of discomfort and dryness in the pharynx, which is attended by frequent attempts to clear the throat, and scanty expectoration of viscid mucus. Subsequently there is a feeling of rawness or scratching, as if caused by sand or a hair in the throat; after violent attacks of coughing the patient will complain of tenderness, soreness, or sticking pain, aggravated by swallowing, similar to that produced by the presence of a sharp foreign body. If the naso-pharyngeal space is involved, the posterior nares may be occluded by hypertrophy of the posterior extremities of the turbinated bodies; there is then partial or complete deafness, relaxation of the soft palate, and elongation of the uvula. In these cases the secretions gradually pass downward in tough and glutinous masses, or the posterior pharyngeal wall may be overspread with adherent dry or moist scabs. The attempt to dislodge this secretion from the throat, by frequent hawking, is one of the most noticeable symptoms of this affection. When the inflammatory process extends downward, not only the larynx but the upper part of the œsophagus and the epiglottis are affected. Hoarseness, feebleness of voice, and, in some cases, complete aphonia, are the symptoms which urge the anxious patient to seek medical advice.

There is no uniformity in the description of symptoms. Slight changes from the normal may cause great discomfort in the hypersensitive individuals, while some patients are surprised to learn of the presence of marked pathological conditions.

Diagnosis.—Upon examination a variable number of oval or circular reddish smooth elevations will be seen jutting out from the surface of the mucous membrane on the posterior wall of the pharynx. They are of variable size, from a pin's head to a pea split in half. These may appear in isolated groups, or in large patches; in the mucous membrane dilated blood-vessels can often be seen coursing between these enlarged glandules, in which they sometimes seem to terminate. The progressive development and increase in number of these follicles continues till they come together, their coalescence resulting in the formation of ridges.

A variety of pharyngitis designated PHARYNGITIS LATERALIS HYPERTROPHICA, is found, in obstinate cases, to consist of long ridges or broad bands of hypertrophied tissue, occupying the lateral wall of the pharynx, behind the posterior pillars, in the location of the salpingo-pharyngeal folds. Under such circumstances the Eustachian tube is involved in the inflammatory process, causing defective hearing.

In the so-called exudative form, which most frequently occupies the tonsils and the anterior and posterior pillars, the enlarged follicles often rupture, and from a very small opening at their apex is discharged a thick, caseous matter which adheres most tenaciously to the mouths of the follicles. From hypertrophied and indurated follicles small calcareous concretions have been disclosed. The glands and follicles at the base of the tongue are sometimes implicated.

Prognosis.—Without treatment chronic follicular pharyngitis may continue for years without peril to life; but the diffusion of the inflammatory process may permanently injure the ear or larynx, causing deafness or persistent enfeeblement of the vocal function. Timely and appropriate treatment, faithfully pursued for a prolonged period, will generally cause a restoration of the functional activity of the parts.

Treatment.—Of first importance is the adoption of suitable measures to improve the general health of the patient. Disturbances in the gastro-alimentary tract, and hepatic torpor must be corrected; free nasal respiration is to be established by the removal of nasal or post-nasal obstructions; the habit of mouth-breathing should be overcome; the vocal apparatus should be allowed a period of rest, and the use of tobacco and alcoholic stimulants proscribed.

Local.—In cases of slight congestion the topical application of astringent solutions will often be of service. Chloride of zinc (grs. xv–xx.); nitrate of silver (grs. xxx–xl.); alumnol (grs. xlv); sulphate of copper (grs. x–xx.); perchloride of iron (grs. xx–lx.); dissolved in fluid ounce of distilled water. At first these applications should be made daily, by means of a camel's hair brush or cotton pledget, using the weaker solutions. Subsequently the strength of the solution may be increased, as the applications are made less frequently. Before making an application the parts should be cleansed, and caution employed in pressing out of the cotton or brush, against the neck of the bottle or on blotting paper, any surplus of the solution, to avoid needless irritation of the parts below.

Surgical treatment consists of obliteration of the lymphoid glandules by means of the galvano-cautery. First cleanse the pharyngeal wall; then, by means of a ten per cent. solution of cocaine, anæsthetize the affected part. After a few moments, dry the part with cotton and apply the galvano-cautery point to the enlarged follicle. From three to six follicles may be cauterized at each sitting. The electrode should be applied cold, the current then turned on so as to heat the point a light cherry-red, and should be withdrawn before the current is turned off. Enlarged superficial blood-vessels terminating in or proceeding from these follicles should be divided by the cautery. Cutting off of the blood supply causes shrinking, and finally obliteration, of the follicle. The cauterized area will become covered with a whitish film, which will remain for about one week. Reduction of long ridges or broad bands of hypertrophied tissue can be best effected by moderate scoring or notching with the cautery point. These cauterizations are repeated at weekly intervals, or thereabouts, as long as requisite. In the interim the throat should be cleansed by a saline spray, or, if much inflamed, with calendulated benzoinol. The same method of treatment is applicable in the exudative form, the cheesy matter or calcareous concretions having been first evacuated by means of a curette.

PHARYNGITIS HERPETICA.

(SYNONYMS: *Membranous Sore Throat; Aphthous Sore Throat.*)

In this affection there appears, on the mucous membrane of the soft palate, tonsils, and pillars of the fauces, an eruption resembling that of herpes labialis, or "fever blisters." It is most prevalent in the spring and autumn, and seems to result from exposure to cold. Women, children, and delicate persons are especially susceptible. It may be due to a variety of causes, but chiefly to nervous depression, and some derangement of the mucous membrane of the respiratory and digestive tract.

The disease is ushered in by chilliness, fever, and smarting pain in the throat, which is aggravated by swallowing. Examination reveals a variable number of small white opalescent vesicles, located on the soft palate, tonsils, or lateral folds; at the base of each vesicle the mucous membrane is inflamed and swollen. In the majority of cases the duration of these vesicles is transient, disappearing by reabsorption at the end of two or three days. Occasionally successive crops make their appearance. In other cases the vesicles rupture, and leave shallow erosions. When the tumefaction of the mucous membrane has subsided, and the raw surfaces have become cicatrized, the parts assume their normal condition. In severe cases, however, these eroded surfaces do not heal, but ulcerate, and become covered by a membrane, simulating, in appearance and texture, the diphtheritic exudate.

In the vesicular stage the disease can be readily recognized; but when the false membrane covers the affected parts it is often impossible to arrive at a definite diagnosis. When doubtful, isolate the patient and observe the course of the disease before forming an opinion. Within forty-eight hours the milder disease will be at a standstill or subsiding, while diphtheria progressively increases in severity.

Treatment.—The pseudo-membrane can be easily removed by spraying or swabbing the throat with hydrogen peroxide (14 volume solution), one part to four of water. When the mucous membrane is cleaned, apply, by means of a cotton applicator, permanganate of potash, four grains to one ounce of water, about six times daily.

Ailanthus.—Fauces and tonsils inflamed, with spots of incipient ulceration. Hawking and constant efforts to raise mucus.

Hydrastis.—Hawking, from increased mucus, which is thick and tenacious. Indicated when there is *superficial* ulceration.

Kali bichromicum.—Ulcers on tonsils and fauces; when there is tendency to *deep* ulcerations, with well-defined edges; cheesy exudation. Mucus is tough, and difficult to dislodge.

Mercurius iodatus flavus.—Patches on the inflamed fauces and pharynx; much tenacious mucus, which is hawked up with great difficulty. Ulcerations on right side of throat (**Mercurius iodatus ruber** affects left side).

Natrum sulphuricum.—Blisters on the palate. Tonsils and uvula inflamed and swollen. Ulcers on tonsils. Thick tenacious white mucus.

Consult **Borax, Kali chloricum** and **Lachesis.**

SEPTIC PHARYNGITIS.

(SYNONYMS: *Hospital Sore Throat; Ulcerated Throat.*)

Septic pharyngitis, undoubtedly of bacterial origin, occurs in persons who have been exposed to the influence of vitiated air, from bad drains, and the drinking of polluted water. It also occurs by absorption of septic material, pathologists, hospital internes and nurses being especially liable (hospital sore throat).

Symptoms.—Sore throat is the initial symptom; there is great pain on swallowing, especially of saliva. The patient complains of general weariness, aching of the limbs, and prostration. The tongue is furred, breath is offensive, and appetite is lost. The pulse is weak, temperature elevated, but headache is severe. The glands under the angle of the jaw are swollen and sensitive. The fauces are found to be congested and swollen, with one or several small white superficial ulcers on the surface of one or both tonsils, and sometimes on the soft palate. These ulcers are shallow, of irregular circular shape, and are covered with a gray film, which is more or less adherent; the tonsillar crypts are filled with putrid material.

Diagnosis.—The mode of development and history of the attack will suffice to differentiate it from diphtheria; if not, a bacteriological examination of the exudate should be made.

Pathology.—In this low form of inflammation there is undoubtedly an alteration in the character of the blood. The membranous exudate is caused by ulceration of the superficial layers of the mucosa and of the lymphoid follicles, and consequent molecular death of the part. Microscopically in the superficial layer of the deposit are found degenerated cells and detritus, together with masses of bacteria; in the deeper layers intense congestion and round-cell infiltration are observed.

Treatment.—The local inflammation and thirst will be relieved by the sucking of ice. Spraying the throat with hydrogen peroxide, one part to four of water, every hour, and antiseptic gargles of carbolic acid, permanganate of potash, or boracic acid, will be of great service. When the acute inflammation has subsided, the local application of tincture of iodine, either one-half or full strength, to the diseased follicles, will hasten resolution. As soon as practicable the patient should be removed to a salubrious locality. Fresh air, nutritious diet, and general tonics insure rapid convalescence.

Consult **Ammonium carbonicum, Hepar sulphuris, Muriaticum acidum** and **Silica.**

GANGRENOUS PHARYNGITIS.

Primary gangrenous sore throat is very rarely seen. As a secondary affection it may occur during the eruptive diseases, diphtheria, small-pox, and erysipelas, and as the result of injury and operations. It usually terminates fatally.

RHEUMATIC PHARYNGITIS.

Pharyngitis is very frequently manifested in the course of an attack of rheumatism, in either the acute or chronic form.

Usually the redness and swelling of the mucous membrane is less than in simple catarrhal pharyngitis, but the pain is greater. The pain appears suddenly, continues for two or three days, and then abruptly ceases, shifting to some other portion of the body.

The history of the attack, and the concomitant subjective and objective symptoms, will determine the diagnosis.

Chronic rheumatic pharyngitis should not be mistaken for neuralgia, chronic tonsillitis, enlarged glands, or cancer.

Treatment should be directed to prophylaxis, and the administration of the appropriate remedies for the underlying rheumatic condition.

ERYSIPELAS OF THE PHARYNX.

This is a comparatively rare affection. It may occur primarily in the fauces and pharynx, and from thence spread to the lips and face; or the disease may attack the mucous membrane of the nose, mouth or ear by extension of the inflammation from the skin.

In the erythematous variety there is a diffuse inflammation of the mucous membrane, of a deep red color, having a glazed appearance, and is accompanied with considerable swelling. The phlyctenular and more severe form of the disease is characterized by vesicles, of variable size, which are filled with serum or pus. These vesicles rupture early and leave the surface coated with a thin, delicate, false membrane. Erysipelas which terminates in gangrene of the mucous membrane and the submucous tissues is distinguished by a dark macerated appearance of the affected surface, and the distinctive ichorous odor. The underlying structures are softened, but their substance is usually intact.

Etiology.—Erysipelas of mucous membranes is dependent upon the same conditions as cause the disease on the cutaneous surface. It is most frequent during epidemics of Erysipelas. The contagious variety is believed to be due to the streptococcus of Fehleisen.

Symptoms.—Frequently the initial symptoms are pain in the stomach, and nausea; the temperature may rise considerably before the throat trouble is manifest. After a little the throat feels dry, with stinging pains, worse on swallowing; stiffness of the jaws, accompanied with swelling of the submaxillary and cervical glands. The local symptoms are rapidly intensified, odynphagia, dysphagia, and aphagia quickly following each other.

The fever is relapsing in character, the high temperature irregularly alternating with defervescence.

Diagnosis.—According to Dr. William Porter the erythematous variety of erysipelas of the fauces or pharynx might be mistaken for an ordinary irritative inflammation of these structures. The diagnosis can readily be made, however, by contrasting the dusky-red color, the rapid development, the migratory tendency and constitutional symptoms of erysipelas, with the bright redness, the restricted development, and the comparatively mild nature of ordinary inflammation of the pharyngeal and buccal cavity. The phlyctenular variety may easily be mistaken for herpes, unless there be a concurrent manifestation of the eruption on the cutaneous surface.

Prognosis.—The disease terminates, after a few days, usually either in recovery by way of gradual resolution, or death from exhaustion or suffocation.

If the larynx be implicated, in addition to the symptoms above enumerated there will be dyspnœa and profound prostration, besides the additional danger of extension of the disease to the trachea, bronchi, and lungs. The course of the disease is usually rapid, and in the majority of cases is fatal. Scarification of the larynx is recommended if œdema of the glottis is threatened or has become developed. Tracheotomy is of doubtful value, because of the danger of eventual wound infection.

Apis mellifica is useful in general œdema of the submucous tissue of the tonsils, uvula, soft palate, and even the posterior portion of the hard palate. Tonsils and palate bright red and œdematous. Stinging pains when swallowing.

Belladonna is most useful in the erythematous variety, with its characteristic symptoms.

Cantharis.—Burning, throat feels "on fire" (Arsen. alb.).

Throat inflamed and covered with plastic lymph. Constriction and intense pain in pharynx.

Rhus toxicodendron.—Erysipelatous inflammation, of vesicular variety. Glands are swollen and painful, especially the parotid; cellulitis of the neck.

Consult **Euphorbium offic.**, **Lachesis.**

ACUTE INFECTIOUS PHLEGMONOUS PHARYNGITIS.

It is questionable whether there is any characteristic difference between this disease and Erysipelas of the Pharynx. Writers differ in opinion concerning its etiology. The disease, peculiarly, attacks persons in perfect health, and usually runs a rapid course. The sore throat and odynphagia are quickly followed by laryngeal symptoms, hoareness, and dyspnœa. The patient is rapidly prostrated, soon loses consciousness, and death ends the scene in a few days.

Autopsic records demonstrate a diffuse purulent infiltration of the deeper parts of the pharyngeal mucosa, extending from there to the larynx, trachea, and other parts of the body. The submaxillary and lymphatic glands of the neck are swollen, and the kidneys and spleen were enlarged.

PHARYNGO-MYCOSIS.

This disease is due to a fungoid growth, which is identical with the ordinary leptothrix buccalis. This vegetable parasite, normally present in the mouth, acquires exceptional development in the presence of tartar and decayed teeth. It is essentially a chronic disease, though it may be developed during an attack of acute amygdalitis. The diffuse form is usually seen on the base of the tongue, on the gums and teeth, the glosso-epiglottic pillars and folds, and on the posterior pharyngeal wall; the more circumscribed form is presented in the crypts of the faucial tonsils. The tonsils are especially liable to parasitic invasion when, by reason of impaired health, unhygienic surroundings, or other influences, a catarrhal inflammation may be present, thus furnishing a suitable basis for the cultivation of the fungus. Mouth-breathers, and those having hypertrophied tonsils, are notably subject to the affection. While usually a disease of adult life, it has been observed in young children.

The growths appear, without inflammatory symptoms, in the form of small whitish or yellowish-gray patches or excrescences, either flat or slightly raised above the surface; those growing from the tonsillar cryts form long, thorn-like projections. The deposit is tenacious, very firmly adherent, and is of a dense, horny consistence; when forcibly removed the reproduction in the same locality is extraordinarily rapid.

Symptoms.—The presence of the fungus may cause a feeling of burning or dryness; sometimes there is a sensation of tickling or of a foreign body in the throat, with a disposition to hawk, and frequently a troublesome cough; sometimes symptoms are altogether absent.

Treatment should be directed to the destruction of the parasite by the use of the curette, followed by application of the galvano-cautery. In some cases, after the deposits have been removed, the application of formula 10 will prove efficient.

When the tonsil is the seat of the growth the deposits are apt to reappear again and again despite all treatment. In some cases it may be expedient to slit up the tonsil crypts before the growths can be eradicated. Removal of the growth should be followed by the application of the galvano-cautery or some escharotic.

Antiseptic mouth-washes, attention to the teeth and the general health, and the correction of gastric disturbances and catarrhal conditions obviously comprise the after-treatment.

LUPUS OF THE PHARYNX AND LARYNX.

Lupus is a much more common affection in Germany, Austria, and France than in the United States. The favorite seat of the disease is the face, especially the nose, cheeks, and ears, and only in rare instances is the mucous membrane of the mouth, pharynx, and larynx involved. The pharynx may be invaded primarily, but in most cases it is propagated by extension from the affected skin. It may involve the entire mucous membrane of the mouth, the gums, the soft and hard palate, and give rise to softening, bleeding ulcers, and cicatrizations.

Attention is first attracted to the reddened appearance of the mucous membrane, with spots about the size of a pin's head, somewhat prominent and closely packed together. These papillary excrescences, which are covered with a whitish epithelial cloudiness, unite to form patches with roundish serpiginous borders, which ultimately ulcerate. On the soft palate will be seen numerous nodules, and the posterior faucial pillars will be swollen to such a degree as to almost hide from view the posterior wall of the pharynx. The uvula becomes hypertrophied, and often extends down as far as the epiglottis, giving rise to cough, nausea, and vomiting. When the epiglottis is affected it is hard, rigid and swollen to such a degree as to depress the tongue and render it immovable, rendering mastication and phonation difficult. The epiglottis will present a rough, worm-eaten appearance; sometimes large portions of it are destroyed by the ulcerative process.

The development of the lupus tubercle is extraordinarily slow. After a variable period of time the nodule softens and breaks into an ulcer, the borders of which are soft or hard, granular and prominent. Sometimes, after these ulcers have acquired a certain size, the disease may remain latent for a time and then suddenly, without apparent cause, they become exceedingly active and produce extensive destruction of tissue.

Etiology.—There is a difference of opinion regarding the cause of the disease, some observers asserting that it is a true manifestation of scrofula; others, again, that it is due to a tuberculous taint, while many hold that it is a disease with an unknown cause. As to its relation with scrofula and tuberculosis there are many cases of lupus which unquestionably have associated with them the elements of either one or the other of these affections. The experiments of Koch, who discovered the lupus bacillus, demonstrate the existence of tuberculosis in all cases where the bacillus has been found. This belief has been fortified by the extraordinary results, in a certain number of cases, which have followed the inoculation of Koch's tuberculine.

The disease is insidious and slow in its development; it may exist for some time before being detected by the keenest observer. Pain is slight, or entirely absent. The patient may complain of some stiffness or soreness in the pharynx, and in some cases of slight difficulty in swallowing, which becomes more marked if cicatrizations have caused contraction of the pharynx. If the soft palate has been destroyed by ulceration the voice is nasal, and fluids find their way into the nose on deglutition.

In the larynx lupus is invariably supra-glottic, and the vocal bands usually escape. When the arytenoids and posterior commissure are invaded the thickening of the nodular deposits, together with the contraction of the tissues, may cause such a degree of stenosis as to demand intubation or tracheotomy.

The earliest important pathological element of the disease is the hyperplasia and infiltration that alters the normal conformation of the part, followed by ulceration, which, though slow, is very destructive. This ulceration spreads slowly in one direction while cicatrizing in other directions, so that the area previously occupied by ulceration will be traversed by cicatricial bands, the distinctive feature of which is their liability to recurrent ulceration.

Diagnosis.—When lupus of the throat is preceded by, or is coincident with, lupus of the skin, the disease is not difficult to recognize. When the disease is confined to the throat, lupus is liable to be mistaken for syphilis or tuberculosis. Lupous ulceration is invariably associated with the characteristic nodules, and appears mostly in the very young; the ulceration is very slowly progressive, and is usually painless. The ulcers of lupus are small and disseminated, while in syphilis the gummatous infiltration suddenly softens and breaks down into a single large ulcer. In tuberculosis the loss of flesh is rapid, swallowing is very painful, pulse is quickened, there is nocturnal rise of temperature, and marked tubercular cachexia.

Prognosis.—While lupus is not regarded as a dangerous affection, in the larynx the new formation may become so abundant as to cause stenosis and necessitate tracheotomy. The progress of the disease, as a rule, is slow, and is capable of arrest.

Constitutional Treatment.—As many lupous patients are pale, anæmic, scofulously or tuberculously inclined, and perhaps have not been receiving the proper kind of food, such indications suggest a good, nutritious diet. Under general treatment many cases improve often to a complete cure; relapses are common, however, after almost complete recovery.

The application of **local measures** will vary according to the situation and extent of the disease. Nitrate of silver, either as a concentrated solution, or in the form of the solid stick, may be used once or twice a week. Too extensive cauterization at one time should be carefully avoided. The employment of lactic acid, pure, or eighty per cent. solution, well rubbed into the ulcerated surface, has met with excellent results. Treatment by the galvano-cautery, and scraping with a curette, have both been employed with success. After erasion by the curette it is well to apply a solution of lactic acid—about forty per cent.—so as to thoroughly destroy, if possible, all of the remains of the disease.

Therapeutics.—The following remedies will be found beneficial:—**Arsenicum, Aurum arseniosum, Calcarea carbonica, Calcarea sulphurica, Graphites, Iodum, Kali bichromicum, Kreosotum, Phytolacca decandra, Silica, Thuja.**

TUBERCULOUS PHARYNGITIS.

Acute tuberculous pharyngitis is, comparatively, a rare disease. Though cases of primary pharyngeal tuberculosis have been met with, it is most usually associated with pulmonary tuberculosis. The disease is most frequent in adult life, yet it has been met with in young children.

The local disease, which is essentially an ulcerative process, may attack the palatine folds and extend forward to the soft palate, uvula, and hard palate, or, beginning on the lateral wall of the pharynx, extends to the posterior wall and thence downwards. Previous to ulceration, just beneath the translucent mucous membrane can be seen a number of semi-transparent grayish miliary nodules, which are variable in size and form. These tubercles ultimately undergo disintegration into lenticular ulcers, moderately superficial, with a caseous base, irregular edges, and faint areola. In the base of the ulcer several granulations, sometimes in proliferating masses, may be observed. By confluence these ulcers steadily extend in periphery until extensive areas may be affected. There is an early and rapid infiltration of the contiguous parts.

Symptoms.—The most prominent symptom is extreme pain, which is aggravated by swallowing, and may radiate to the ears; in some cases this pain is so severe as to almost prevent the taking of nourishment. The emaciation and general prostration are quite rapid. There is marked elevation of temperature, and considerable fetor of the breath. The voice has a nasal character, and deglutition is interfered with by reason of the stiffened and paretic condition of the soft palate.

Diagnosis.—Tuberculous pharyngitis may be mistaken for syphilis in its tertiary form. The typical character of the ulceration, the general history as well as the individual and family history will aid in differentiating the two diseases. A diagnosis may be verified by a microscopical examination of a scraping from the ulcer, if tubercle be found.

Prognosis.—The disease generally terminates fatally in from two to six months. In those cases where the disease assumes a somewhat indolent form it is possible, under local treatment, that the fatal issue may be long delayed, or that cicatrization and ultimate cure may be effected.

Treatment.—If the condition of the lungs is such as to encourage energetic treatment, Lactic acid may be applied to the ulcers, with or without previous scraping, at intervals of two or three days, according to the tolerance of the patient. Lactic acid may be applied pure, or in solution of eighty per cent., on a pledget of cotton, employing a fair amount of friction. A five or ten per cent. solution of cocaine should be previously applied. The galvano-cautery will prove serviceable in certain cases. To relieve the pain and discomfort the throat may be sprayed with a five per cent. solution of cocaine, especially before the administration of food. Insufflations of a powder consisting of iodoform, two grains, and morphia, $\frac{1}{6}$ grain, will also be found useful. A twenty per cent. solution of menthol in olive oil is said to promote the cicatrization of tuberculous ulcers. Previous to making any of these applications the affected parts should be cleansed of the mucus and detritus, either by douching or spraying, using a weak solution of hydrogen peroxide, eucalyptol, thymol or carbolic acid.

When dysphagia is extreme, nourishment *per rectum* is indicated.

SYPHILIS OF THE PHARYNX.

Primary syphilis is occasionally manifested in the pharynx; when present it is the product of direct infection. The chancre is usually located on one of the tonsils, sometimes on the faucial pillars. The part affected appears red and swollen, and generally there is an erosion or superficial ulceration of the mucous membrane, the base being very much indurated. The submaxillary and lymphatic glands at the angle of the jaw are invariably enlarged. The diagnosis may be difficult, as the signs are not always characteristic.

When syphilis has become constitutional, either as the result of infection or heredity, the general local manifestations of the disease are observed in the pharynx in the secondary or tertiary stage. The secondary manifestations of the disease—erythema and mucous patches—usually appear in from six weeks to six months after the primary contagion. Gummata and ulceration are characteristic phenomena of the advanced stage of constitutional syphilis.

ERYTHEMA.—The subjective symptoms are those of an ordinary sore throat. There is an uniform deep dusky redness, with a well-defined margin, of the faucial pillars, tonsils, soft palate, and pharyngeal wall; the epithelium over these parts presents a milky opacity, and the surface is more or less eroded; this erythema in part gradually fades away, leaving erosions of a round or oval form, varying in size from a pea to an almond, which are distinctly outlined by abrupt borders, with a tendency to symmetrical arrangement on the two sides of the fauces. The surface is smooth, or slightly raised (papular), in places. A distinct line of demarcation separates these patches from healthy tissue.

MUCOUS PATCHES (Syn.: papules, tubercles, broad condylomata) are generally seen upon the tonsils, faucial pillars, soft palate, and uvula; at first they are slightly elevated and deep red, later of a grayish-white color. They are of a circular or elliptic form, varying in size, and are bilaterally symmetrical. Subsequently they become the seat of superficial ulcers, surrounded by an areola of hyperæmia. Sometimes these patches are found on the lips, especially at the angle of the mouth, and on the margin and tip of the tongue. When occurring in infants, they are found in the fauces and on the soft palate. In some cases these ulcers may cause great pain on deglutition. Although the secondary lesions will in time heal, they are prone to relapse, and may reappear frequently during a period of several years from the date of the commencement of the disease.

Tertiary lesions present themselves about two to five years, sometimes as long as twenty years, after the primary infection. Gummata may appear anywhere within the mouth, but the soft or hard palate, and not infrequently the posterior pharynx, high up, is the seat of the disease. They are usually more or less diffuse, though occasionally a circumscribed, well-defined tumor is disclosed. In the beginning they appear as small submucous swellings, varying in size from that of a pea to a small nut; they are unattended by pain, their growth usually being slow, though in some cases it may be rapid from the beginning. As they increase the mucous membrane covering them becomes injected—is dark red in color. Coincidently the glands about the angle of the jaw begin to enlarge. After a variable time the gumma arrives at a stage of softening, a yellowish spot appears at the surface, and perforation ensues, causing fistulæ or ulcers, the stage of infiltration often escaping observation unless the rhinoscopic mirror be used. Gummata do not inevitably terminate in ulceration; under appropriate treatment they may be reabsorbed.

Ulcerations of tertiary syphilis may appear in various forms.

The superficial variety is most commonly found on the velum, and often on the faucial pillars and tonsils. They usually affect only the superficial tissues, but they extend rapidly, and produce a peculiar worm-eaten appearance. Frequently they assume a crescentric form, spreading at the edges and healing in the center—the serpiginous ulcer. They secrete an ichorous pus, which, when removed, reveals a pale and smooth base, with a few scattered fungoid granulations. Fissures often extend from the irregular and ragged edges of the ulcer into the surrounding tissue.

Perforating ulcers, whether sequelæ of gummata or not, are situated on any part of the palate, tonsils, fauces, or posterior pharynx, and are surrounded by red, swollen, indurated tissue. The gummatous ulcer, once formed, destroys all the tissues which have been infiltrated, cartilage and bone offering no obstruction to its progress. If the ulcer is situated in the palate, a fissure may occur on the edge of the soft palate, or a perforation may occur through the substance of the palate, usually in or near the median line. Sometimes this perforation extends to the edge of the soft palate, dividing the velum into two portions, similar to congenital cleft. If a large fistulous communication is established between the oral and nasal cavities it will cause nasal speech and great inconvenience in swallowing fluids, which are ejected through the nose on deglutition. The fistulous openings have clean-cut edges, and cicatrize slowly. The ulcerative process may attack the posterior pharyngeal wall and the soft palate, resulting in cicatricial adhesion, affecting one or both sides to such an extent as to leave only a minute opening between the pharynx and nasopharynx. The rapid advance of these ulcers causes the loss of the uvula in a few days, and large portions of the soft palate are eaten away from the edge inward. When these ulcers heal they may leave the pharynx greatly distorted by cicatrices; the speech has a nasal twang, nasal respiration is obstructed, and the hearing, smell, and taste may be seriously impaired or lost. If the lower part of the pharynx is constricted, there will be dysphagia and dyspnœa; the membranous obstruction may pass from the posterior or lateral wall to the base of the tongue, the edges of the epiglottis becoming adherent to the margin of the opening.

Sometimes these tertiary ulcers do not constantly advance, but may remain stationary for a long time, giving little pain. The throat feels dry, and a few bloody scabs are occasionally expectorated.

The **symptoms** of tertiary syphilis are often latent and insidious, and may cause little or no trouble until attention is called to the gravity of the condition by the sudden perforation and the nasal voice and regurgitation of fluids through the nose. Pain and dysphagia are occasionally severe.

Some cases of syphilitic ulceration are exceedingly difficult to distinguish from cancer; but the progress of the disease and a microscopic examination will determine its nature.

The **prognosis** of syphilitic pharyngitis is favorable except when, in the tertiary stage, the ulcerative process penetrates deeply into the tissues.

Treatment.—Local cleansing is highly important in each stage of the disease. Formula 11, recommended by Sajous, is an excellent disinfectant, and produces stimulation and speedy resolution.

Before the local remedy is applied the parts should be thoroughly cleansed. Tobacco and irritating food or drink must be avoided.

The obstinate manifestations of the secondary stage can be made to disappear rapidly by the local application of a solution of Nitrate of silver (grs. xl., water ℥i), or a weak solution of Chromic acid (grs. x., water ℥j); the latter can be entrusted to the patient to apply daily with a camel's hair brush, after thorough cleansing.

In the tertiary form the ulcers may be treated with the solid Nitrate of silver, Sulphate of copper, and Tincture of iodine. Iodoform dusting is also useful. If the adhesions have become converted into a thick fibrous mass, and hinders respiration and deglutition, surgical procedures are indicated; but it must be remembered that relapse is almost certain, and a permanent opening can only be maintained by the constant use of bougies. The difficulties of deglutition and phonation which occur when the hard palate has been perforated may be overcome by the dentist in the adaptation of a suitable plate.

Mercurius corrosivus.—Intense inflammation of the uvula and arch of the palate, with great swelling; excessive sensitiveness of the glands; ulceration of pharynx and soft palate. Burning pains (like **Arsenicum**); ulcerations, dark red.

Mercurius iodatus flavus.—Posterior wall of pharynx red, inflamed, with ulcerated spots. Much tenacious mucus in throat, difficult to dislodge and causing retching. Throat feels dry, hot, and swollen. Sensation of lump in throat.

Mercurius nitrosus.—Soreness of pharynx, with redness and dryness. "Mucous patches," with sticking pains.

Mezereum.—Syphilitic pharyngitis, with burning and dryness extending down the œsophagus. Roughness, rawness, soreness, and constriction of the pharynx.

Nitrum acidum.—Syphilitic ulceration of the throat. Pricking, sticking as from a splinter in the throat. Swallowing is difficult. Ulcers in fauces, with salivation. Hawking of mucus. Submaxillary glands are swollen and painful.

Fluoricum acidum.—Syphilitic ulceration of the throat. Soft palate intensely red and much tumefied; fetid breath, nasal voice, indistinct articulation. Throat very sensitive to cold; constriction with difficult deglutition.

Aurum metallicum is useful in the tertiary stage of the disease. Boring in the hard palate; caries in the palate. Burning, worse on swallowing, with stitching and stinging.

Kali iodatum.—Redness and swelling of soft palate; ulceration of mouth or throat; swallowing painful and difficult. This remedy is an antidote to the syphilitic poison in the secondary, and especially in the tertiary, form of the disease. When Mercury has been too freely given, from five to thirty grains of crude Kali iodatum should be given three times a day. This may be continued for several weeks, when the use of Mercury may be resumed, if indicated.

Consult **Cinnabaris, Kali bichromicum, Phytolacca.**

RETRO-PHARYNGEAL ABSCESS.

This is pre-eminently a disease of infancy, although it may occur at any age. The retro-pharyngeal abscess of infancy is ordinarily due to a suppurative inflammation of the lymphatic glands and cellular tissue lying between the mucous membrane of the pharyngeal wall and the cervical vertebræ. These lymphatic glands, situated on either side of the second and third cervical vertebræ, are especially large up to about the seventh year of life, and are inclined to disease by reason of the diathetic predisposition to inflammation.

A retro-pharyngeal adenitis does not invariably go on to suppuration. An abscess in this region is usually the result of secondary infection of the pharyngeal lymphatics from lacunar and suppurative forms of tonsillitis, a severe rhino-pharyngitis, an attack of influenza, or the anginas complicating the exanthemata, and is set up by the entrance of pyogenic bacteria. It is seen more often in those who are delicate, and who in consequence are prone to severe catarrhal affections, and almost invariably is accompanied by enlargement of the deep lymphatic and cervical glands. The greatest number of cases occur within the first two years of life, and is most frequent during the period of suckling. A retro-pharyngeal abscess may result from injury by a foreign body—as the lodgement of a pin, fish-bone, etc.—or form caries of the cervical vertebræ.

Symptoms.—The disease may commence quite insidiously, or it may culminate rapidly. There may be a chill, followed by high temperature (100–104° Fahr.), headache, and dull throbbing pains, with occasional sharp, lancinating stitches, and prostration, which may be out of proportion to the local disease. In children convulsive symptoms are often present. Attention is directed to the throat by the dysphagia, and later by dyspnœa. When the abscess is located in the nasopharynx (which usually can only be diagnosed by digital palpation), there will be difficulty in swallowing, especially of solids, and the voice will have a nasal twang, but there will be no important disturbance in respiration. The position of the head, dull pain and stiffness in the neck, and external swelling, furnish a valuable means of diagnosis. An abscess in the oro-pharynx may present a swelling in the centre of the pharyngeal wall, or usually to one side. Deglutition is difficult, but respiration is not interfered with until the abscess attains great size. A comparatively small abscess in the laryngo-pharynx may occasion alarming symptoms; there will be marked dyspnœa, hoarseness or complete aphonia, with spasmodic suffocative attacks, cough, stertorous breathing; swallowing may be difficult and dangerous, from the fortuitous passage of food or drink into the larynx. Dyspnœa and dysphagia are the most prominent symptoms.

Retro-pharyngeal abscess from cervical caries is usually larger; it forms very much more slowly, often lasting for months. The swelling is frequently in the median line, and is quite diffuse. External swelling is usually seen, and it may be large. In these cases, as also when the abscess is located in the lateral pharynx, the patient is endangered by the possible burrowing of pus along the deep fascia of the neck, and pass into the thorax or mediastinum, or fatal dyspnœa may ensue from œdema of the glottis through extension of inflammation, or purulent infiltration, to the ary-epiglottic folds. The symptoms of spondylitis are present some time before the appearance of the abscess; in some cases the abscess precedes the deformity, and it may be the first intimation of the existence of bone disease.

Diagnosis.—The symptoms may resemble and be mistaken for catarrhal laryngitis, membranous croup, œdema of the glottis, and perhaps tonsillitis. Precision in diagnosis can only be assured by inspection and careful digital palpation of the fauces, though sometimes this is difficult. Rough manipulation, or severe pressure, should be absolutely avoided. The symptoms which should attract attention are dysphagia, dyspnœa, cough, alteration of the voice (nasal or palatal), and the fixed position of the head, which is inclined forward and aside, away from the abscess.

Prognosis.—The affection usually terminates in recovery in from five to fifteen days, in many instances the abscess discharging spontaneously. Prompt recognition of the disease and evacuation of the pus is desirable to avert a rapidly fatal issue from asphyxia due to pressure upon, or œdema of, the larynx, or to rupture of the abscess into the air-passages, especially if the abscess was of large size and the contents should be rapidly discharged.

Treatment.—If the abscess be immature, hot applications should be made to the throat, to relieve the symptoms and to hasten suppuration. Spontaneous opening should never be waited for. A long, straight, narrow-bladed knife, having all of its blade protected by adhesive plaster except half an inch at its pointed extremity, is inserted into the abscess and an incision made running longitudinally from above downward. The head of the patient should then be held forward, face down, to allow the pus to escape from the mouth. If the abscess is very large, the pus may be drawn off with an aspirator, although it may be difficult to keep the needle in position when the patient is very young. An abscess cavity not infrequently refills after it has been evacuated, when it is necessary to reincise; or it may be reopened by means of a blunt-headed dressing forceps, guided by the finger, introduced at the point of incision and the opening carefully dilated.

Abscesses resulting from spondylitis, or such as are caused by foreign bodies, when there is deep suppuration of the cervical glands, should be opened as soon as they are large enough to give rise to local symptoms. They should be opened externally, the incision to be along the anterior or the posterior border of the sterno-cleido-mastoid muscle, according to the circumstances of the particular case. This method is preferable to operating through the mouth, since it gives better drainage and the after-treatment is more easily carried on; a sinus opening externally is less objectionable than one opening into the pharynx. After cutting through the skin and fascia, the balance of the dissection should be continued with blunt instruments.

The principal remedies are **Hepar sulphuris** and **Silica.** Other valuable remedies are, **Aurum, Belladonna, Lachesis, Lycopodium, Mercurius solubilis, Nitrum Acidum, Phosphorus.**

MORBID GROWTHS IN THE PHARYNX.

BENIGN GROWTHS.

Although almost every variety of growth has been found in the pharynx, aside from papillomata they are nearly all of infrequent occurrence. Papillomata are found growing chiefly from the margin of the soft palate, the faucial pillars, or from the uvula; sometimes they start from the tonsils or the posterior wall of the pharynx. Mucous cysts, adenomata, myxomata, and enchondromata have been observed. Fibromata, which occur in youth or mid-life, are of slow growth and in many cases are pedunculated, and may encroach on the laryngeal region, causing cough and dyspnœa. An exostosis from the anterior portion of the cervical spine may form a tumor in the pharynx, and may be mistaken for angular curvature.

The symptoms depend on the size, shape, and situation of the growth, and the nervous excitability of the patient.

Papillomatous and pedunculated growths are easily removed with the scissors, the cold wire snare or galvano-cautery snare. Thorough extirpation, with subsequent application of galvano-cautery to the base of the growth, is advisable, to prevent recurrence. The removal of non-pedunculated growths must be conducted on general principles.

MALIGNANT GROWTHS.

Epithelioma is the most common form of malignant disease in the pharynx, and originates most frequently in the soft palate, the faucial pillars, or the posterior wall of the cricoid cartilage—in those localities which are specially exposed to friction. It is a disease of middle and advanced life, and occurs more often in man than in woman. It usually begins as a nodule of small size, the center of which soon breaks down into an ulcer, the margins being hard, sinuous, and everted. The growth develops rapidly, ulcerates very soon, and becomes distributed by the lymphatics. Involvement of the lymphatic glands points to a fatal termination; removal of the epitheliomatous lesion does not usually arrest the progress of the disease, except in the earliest stage.

Sarcoma of the pharynx develops very insidiously, and tends to invade or infiltrate the structures in the immediate neighborhood. It usually starts from the posterior and lateral walls of the pharynx. *Round-cell sarcoma* grows very rapidly, is soft in consistency, and has a great tendency to ulceration. The *spindle cell* or *giant-cell* variety is much less malignant and slower in growth than the round-cell variety, is firm in consistence, frequently pedunculated, and does not tend to ulcerate. The tumor becomes, and may remain, encapsuled for a considerable time, and the glands continue unaffected.

Sarcomata which have undergone mucoid changes are known as *Myxo-Sarcomata.* They are usually polypoid, lobulated, and translucent, and are regarded as being only locally malignant; they do not extend to other parts, even though they may recur after removal.

Lympho-Sarcomata occur at all ages, but especially in early life. They are found in all organs which contain connective tissue, especially the loose variety, and appear always to arise from this, and then invade the lymphoid structures. They grow and multiply rapidly, and, as a rule, recur after removal.

Malignant disease of the pharynx will usually have progressed considerably before the more prominent symptoms of dysphagia, pain, and the involvement of the lymphatic glands at the angle of the jaw shall have become manifest. The pains in the throat are sometimes slight until ulceration occurs. Though their onset be gradual they are persistent and finally severe, frequently intensely darting in character, radiating towards the ear, and aggravated by swallowing. The breath is very offensive, and vast quantities of saliva are discharged daily. The cachexia is well-marked, and loss of flesh is generally rapid.

The main difficulty in diagnosis is to differentiate between malignant, tuberculous, syphilitic, and lupous ulcerations. When there is any doubt a microscopic examination of a portion of the growth should be made.

The prognosis is unfavorable, though malignant disease of the tonsils and fauces is not invariably hopeless. The duration of the disease varies from a few months to three or four years. The early and radical extirpation of the growth, employing either the galvano-cautery or the knife, may sometimes prove a perfect success. In the majority of cases palliative treatment only is practicable. Termination by death is usually the result of inanition, asphyxia, or hemorrhage. The patient's strength must be maintained; antiseptic and anodyne applications should be employed to cleanse the ulcerated surface and to relieve pain.

NEUROSES OF THE PHARYNX.

Anæsthesia of the pharynx is a frequent consequence of diphtheria. Occasionally it attends epilepsy, and is not unfrequently observed in typhus fever, cholera, and general paralysis of the insane, and sometimes it occurs in hysteria. It may result from the application of extreme cold—ice—and the internal administration of the bromides or morphia, and from local or general anæsthesia. It may be partial or complete, and may affect one or both sides.

Except when the trouble is a symptom of progressive bulbar paralysis the prognosis is favorable.

Treatment.—**Gelsemium** is the principal remedy. If deglutition be difficult, nourishment *per rectum* may be necessary. The application of the continuous current may be indicated.

Hyperæsthesia.—Morbidly acute sensitiveness of the pharynx is frequently associated with a gouty diathesis, and is found in hysterical patients and those who are subject to acute and chronic inflammation of the pharynx; those who use tobacco or alcohol to excess are especially liable to the affection.

Treatment.—The cause should be ascertained, and, if possible, removed.

Paræsthesia.—This affection is usually of a nervous character, and commonly results from hysteria. The patient complains of the sensation of a swelling, a hair, a burning, pricking, or foreign body in the throat. This sensation is often present after the removal of a foreign body from the throat, and may persist for an indefinite period. This symptom may be dependent upon a varicose condition of the veins, or enlargement of the glands, at the base of the tongue, or to a subacute follicular pharyngitis. The fauces should be thoroughly inspected to ascertain the cause.

Treatment.—As most of the cases will be found in individuals who are neurasthenic or anæmic, attention should be directed to the general health, and the removal of the cause.

Neuralgia of the pharynx, a somewhat rare affection, bears a close analogy to paræsthesia. Though it occurs in anæmic individuals and in those of a rheumatic diathesis, many of the patients are otherwise healthy. In some cases it may be due to hypertrophic pharyngitis. The pains usually occur in paroxysms.

Spasm of the pharynx, in mild form, is a functional disorder ; it is usually associated with acute inflammation of the fauces, or it may result from swallowing imperfectly masticated food ; it may also be a neurosis, as seen in nervous, hysterical patients. In severe cases it may be due to hydrophobia, tetanus, and reflex symptoms of tumors of the brain.

Treatment.—**Sumbul** is an excellent remedy for this affection.

Paralysis of the pharynx may result from diphtheria or syphilis, or it may be due to degenerative changes in the brain, involving the nerves which supply the pharyngeal muscles. Upon inspection the velum palati and uvula are found to be relaxed, and one or all of the pharyngeal constrictors be paralyzed. Whether the paralysis be unilateral or bilateral one pillar of the fauces usually hangs lower than the other.

There is difficult deglutition and the voice has a nasal character. Though liquids are more easily swallowed than solids, they frequently pass into the larynx ; both fluids and solids are often forced into the posterior nares when the soft palate is paralyzed.

It is highly important to keep the patient well nourished, but no attempt should be made to swallow *solid* food until the muscles of the pharynx are fully restored. The application of the galvanic current, every day or two, will cause a rapid amelioration of the symptoms.

The following remedies have been found useful in the treatment of above-named conditions: **Alumina, Belladonna, Conium, Hepar sulphuris, Hyoscyamus, Ignatia, Lobelia, Lachesis, Lycopodium, Mercurius solubilis, Nitric acid, Silica, Sulphur.**

ACUTE TONSILLITIS.

(SYNONYMS: *Amygdalitis; Angina tonsillaris; Cynanche Tonsillaris; Quinsy; Angina Phlegmonosa; Phlegmonous Sore Throat.*)

Though the tonsils participate in the catarrhal conditions as found in acute pharyngitis, when the inflammation is located chiefly in the tonsils it constitutes a tonsillitis (or amygdalitis). Inflammation of the tonsils, for clinical purposes, may be divided into four classes:

1. When the inflammation is confined to the mucous membrane, it is called *catarrhal*, *superficial*, or *erythematous tonsillitis.*
2. When the lacunæ or only a few crypts are involved, resulting in arrest of their functions, it constitues *lacunar* (improperly called *follicular*) *tonsillitis.*
3. When the whole gland structure of the tonsil is involved, it is called *phlegmonous*, or *parenchymatous*, tonsillitis.
4. When the inflammation affects the tissue around the gland, it is known as *peritonsillitis.*

Parenchymatous tonsillitis and peritonsillitis, when accompanied with the formation of pus, is termed *suppurative tonsillitis*, *tonsillitis abscedens*, or "*quinsy.*"

Although the inherited vulnerability of the tonsils is unquestionably associated with diathetic influences, there are many cases in which no special diathesis can be traced. There is little doubt that there is an intimate connection between the strumous and rheumatic diatheses and idiopathic tonsillitis. As the tonsil belongs to the lymphatic system, tonsillitis is very apt to manifest itself in subjects of enlarged glands, and in whom there is some constitutional dyscrasia. Such persons are very liable to recurrent attacks, and such recurrences are frequently induced by slight provocations. The nature of the relationship between tonsillitis and rheumatism, and whether they are produced by the same morbific agency, are questions which have not been definitely determined ; but it has been frequently observed that inflammatory conditions in the throat have been closely followed by rheumatic fever. Enlarged tonsils, lacunar calculi, cold, uncleanliness of the mouth, and traumatism are additional circumstances favoring an attack.

Tonsillitis may be present as a complication in scarlet fever, measles, and small-pox. It may also arise from the inhalation of irritating vapors or the swallowing of caustic fluids. The tonsils may become inflamed as the result of laceration or wounds, the impaction of foreign substances — as fish bone, etc. — in swallowing, or from the irritation due to calcareous aggregations in the tonsillar lacunæ. In some cases it is purely traceable to septic influences, as the drinking of impure water, the exhalation of sewer-gas, unhygienic surrroundings, etc.

Acute tonsillitis is uncommon in infancy, but it is liable to occur at about the period of the second dentition, the disposition to the disease becoming more frequent between the ages of fifteen and thirty. Though it occurs occasionally in advanced age, the proneness to inflammation diminishes after the fortieth year, due to atrophic changes occurring in the tonsils. There exists in certain individuals a peculiar susceptibility to attacks of tonsillitis, and these recurrent attacks increase the liability ; in many cases a chronic enlargement of the tonsils unquestionably acts as a predisposing cause. Most recent authorities attribute to the enlarged and easily inflamed tonsil the responsibility of begetting the various septic conditions which originate scarlet fever and diphtheria. Reduction in the size of these glands, either by ablation or as the result of atrophic change, minimizes the danger of these septic diseases to an insignificant degree.

Attacks of tonsillitis, of either the suppurative or non-suppurative form, are most prevalent in early spring and the later months of autumn, when cold, damp weather prevails; sometimes it is almost epidemic. The affection occurs principally in temperate but very moist climates, and where the temperature changes are sudden.

Symptoms.—A feeling of uneasiness and aching in the back and limbs, chilliness, and febrile temperature more or less marked, are the symptoms which usually usher in an attack of tonsillitis. There is a sense of great heat, stiffness, and soreness in the throat, with more or less pain on swallowing. As the local condition becomes intensified the temperature tends tc rise, until it may reach 105°. In persons who have had repeated attacks the fever seldom runs high. Constitutional symptoms are most prominent when the inflammation manifests a tendency to terminate by suppuration. The tongue is coated with a yellowish-white fur, the breath is very offensive, and in severe cases there is great difficulty in opening the mouth. Constipation invariably precedes and accompanies tonsillitis. The highly-colored urine is loaded with urates, and contains an excess of urea and sometimes a trace of albumen, but no casts. The albumen disappears when the temperature begins to fall.

In superficial tonsillitis there is redness and swelling of the tonsils, palate, uvula, and fauces, with more or less pain on deglutition. It is attended by some fever, seldom high. Its course is usually short, in mild cases lasting but two or three days. In cases where the inflamed tonsil has been normal the swelling will be much less than when the tonsil has been hypertrophied.

Lacunar tonsillitis is associated with, if it is not dependent upon, disorders of digestion for its origin. The precedent symptoms of indigestion, acid eructations, heavily-coated tongue, and distress in the gastric region are attended by extreme languor and debility out of proportion to the local morbid process. A chronic hypertrophy of the tonsils, or a chronic dilatation of the crypts, associated with a retention of their contents, unquestionably constitutes one of the most potent predisposing causes of this variety of the disease. Both tonsils are usually implicated, often to an equal extent, but the swelling is less intense than in the parenchymatous variety. If only one tonsil is involved the unaffected one may participate in the inflammatory condition as the symptoms of the one first affected are about to abate. The mucous membrane is of a very bright red color, and around the orifices of the lacunæ may be seen a whitish or creamy secretion. Sometimes the tonsil may be quite covered with patches of exudation, due to the coalescence of several individual patches, which is the product of the catarrhal process, or it may be the result of suppuration of the lymph follicles. This exudate, which is more or less adherent, may be soft and pultaceous, or somewhat firm, in character, and in some cases, especially in children, it is difficult, clinically. to differentiate it from mild forms of diphtheria. This deposit may be limited to the tonsils, but occasionally, in course of the disease, there may appear on the palate and posterior pharyngeal wall a grayish-white mass resembling that found on the tonsils, which consists of mucus, desquamated epithelium, and pus corpuscles, and which can be more easily rubbed off than can the deposit on the tonsils without causing an abrasion of the mucous membrane underneath.

The course of lacunar tonsillitis frequently exhibits presumptive evidence that it is a contagious disease. It occurs sometimes in an epidemic form, and members of the same family are often attacked, either simultaneously or consecutively. In some cases it has been traceable to drain-poisoning, and it often prevails in association with epidemics of scarlet fever and diphtheria. It sometimes presents a general resemblance to the diphtheritic membrane, and not infrequently has led to an error in diagnosis.

As the composition of the deposit on the tonsils in lacunar tonsillitis presents marked differences in color, consistence, appearance, and structure, it is thought that under this designation are included several varieties, somewhat different, each variety being determined by a distinct micro-organism or combination of micro-organisms. While the streptococcus pyogenes is probably the most frequent cause, there have been found the staphylococcus albus and aureus, the pneumococcus, the leptothrix, and various septic micro-organisms.

In parenchymatous tonsillitis there is intense congestion and increase in size of the tonsil, and the adjacent parts of the pharynx and palate participate in the morbid action. This variety is generally unilateral. If both tonsils are simultaneously affected*—which occurs with greatest frequency in those who have had repeated attacks of the disease, or in strumous subjects—the soft palate and faucial pillars are pushed forward, the uvula is œdematous, and the tonsils often meet in the median line. In severe cases the lymphatic glands at the angle of the jaw, especially on the side most affected, are enlarged and tender, and there is œdema of the surrounding connective tissue. Under such circumstances the movements of the head and neck are constrained and painful. As the tonsil increases in size and the inflammation extends to the contiguous structures there will be severe pain about the angle of the jaw and radiating towards the ear, which is further aggravated by the attempts at swallowing the viscid mucus which is constantly accumulating in the fauces.

In peritonsillitis, which is invariably unilateral, the activity of the inflammation is expended upon the mucous membrane and the connective tissue about the gland, and the formation of pus takes place in the subjacent connective tissue. The swelling lies below and largely in front of the tonsil, and extends to the base of the tongue.

Among the suppurative forms are peritonsillitis (*circumtonsillar phlegmon*), and parenchymatous tonsillitis (*tonsillitis phlegmonosa*). In peritonsillitis the formation of pus is in the cellular tissue immediately *external* to the tonsil; in parenchymatous tonsillitis the pus forms *in* the tonsil.

Suppurative tonsillitis, which is practically the advanced stage of the inflammatory process, is a common affection, of which the peritonsillar form is the more common. It occurs with greatest frequency in young adults, and certain predisposed persons are prone to oft repeated attacks. Hypertrophy of the tonsils is unquestionably a predisposing cause, while the immediate cause is often assigned to cold.

The suppurative stage frequently develops somewhat gradually, but the attack may commence quite suddenly with chills and a marked rise of temperature. As a rule, however, the general disturbance and febrile symptoms are less than in lacunar tonsillitis. With the progression of the disease the pain increases; it is frequently so severe that swallowing is almost intolerable, and the patient refuses all food. The infiltration of the tissues, internal and external, is often so great at the height of the disease that the mouth can be opened only with great difficulty, and it may be impossible to secure an examination of the throat. Suppurative tonsillitis is generally unilateral; when bilateral, suppuration on the two sides seldom occurs simultaneously.

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*In such cases Kingston Fox believes the inflammation is almost invariably of a septic nature, and regards it as a diagnostic indication.

In association with the swollen tonsil, which is of a deep dusky red color, there is often great tumefaction of the soft palate, uvula, and anterior pillar, the latter being so prominent as to almost overlay the affected tonsil. In some cases the swelling may include principally the posterior pillar, and then the tonsil and anterior pillar will be forced forward. The voice is muffled, thick, and indistinct, and words are almost unintelligible. Extension of the inflammation to the mucous membrane lining the Eustachian tube causes temporary loss of hearing, tinnitus, and sometimes inflammation of the middle ear.

Diagnosis.—As a rule the diagnosis presents no difficulty if the history of the case and the subjective and objective conditions are carefully noted; yet in certain cases the disease may be confounded with diphtheria, scarlet fever, syphilis, and cancer.

In acute lacunar tonsillitis the secretion is usually limited to the tonsils, and is slightly adherent; the tonsils are enlarged and inflamed. The temperature rises suddenly, and in many cases falls with almost equal rapidity. The pulse, although rapid, is usually full, bounding and regular. In diphtheria the leathery pseudo-membrane is firmly adherent on the tonsils, soft palate, and uvula; the tonsils are not always enlarged. The temperature may be normal or slightly elevated. The onset is more gradual, and the pulse, as a rule, is rapid and weak. Albumen may occur in the urine in tonsillitis, but its presence points to diphtheria rather than to tonsillitis. Since certain forms of tonsillitis may be transmitted from one person to another, it is prudent to recommend isolation, which will also guard against the danger incident to a possible erroneous diagnosis.

Simple tonsillitis may be mistaken for the sore throat of scarlet fever, but the characteristic cutaneous eruption, the strawberry red tongue, and the glandular enlargement at the angle of the jaw, will facilitate the diagnosis.

The history and general symptoms, the pulse and the temperature, will prevent the mistaking of tonsillitis for secondary syphilis, cancer, or any of the maladies which it may simulate.

The **prognosis** is favorable, but there is a liability to frequent subsequent attacks. After a severe attack of tonsillitis the parenchyma of the gland becomes thickened and indurated, resulting in hypertrophy and chronic inflammation of the tonsil, particularly in debilitated persons. Though the disease invariably tends to recovery death has occurred from hemorrhage on the bursting of an abscess, or to the entrance of pus into the air-passages by the sudden bursting of the abscess during sleep.

Treatment.—As constipation is an invariable accompaniment, it is all-important to maintain, throughout the attack, thorough alvine evacuations. The superficial form of tonsillitis runs a favorable course in from one to three days if the patient be confined to the house, on a light diet, and the indicated remedy be administered. In the first stage of lacunar tonsillitis the use of ice not only causes an abatement of the painful symptoms, but may be successful in aborting the disease. It may be constantly held in the mouth, and externally cold applications, either by means of the Leiter coil or linen compresses, placed anteriorly from ear to ear, are generally to be recommended for the first two or three days. The painful condition of the parts will often prevent gargling. In any case too frequent gargling is hurtful. As a mouth-wash Acidum boricum and Sodii boras, equal parts, one teaspoonful dissolved in a tumbler full of warm water, will be found to be a cleansing and disinfecting solution. Camphorated Phenol, when applied daily, or twice daily, early in the attack, not only relieves the pain but cuts short the attack. The local application of nitrate of silver solution, sixty grains to water one ounce, will mitigate the attack in a large proportion of cases. Care should be exercised that none of the solution drops into the lower pharynx.

There are some cases of peritonsillitis and parenchymatous tonsillitis which may be aborted if they receive early and judicious treatment, but in the majority of instances the morbid action inevitably leads to the formation of an abscess; in such cases every endeavor should be made to encourage suppuration and shorten the disease. The external application of hot poultices or fomentations, and holding hot water in the mouth so as to come in contact with the parts, will relieve pain and tend to bring the abscess to the surface. As soon as pus can be detected an incision should be made with a curved pointed bistoury at the point of most prominent fluctuation. It is often difficult to determine the best point at which to make the incision in order to reach the abscess, but even if pus is not reached there will be an abatement of the tension and pain, and eventually the pus may be discharged at the site of the incision. In order to secure against the closure of the opening it may be prudent to pass in a director on one or more subsequent days. The escape of pus causes a rapid subsidence of pain and other troubles, and convalescence is straightway established unless the disease recurs on the opposite side.

If gargling is not difficult or painful, alcohol and water will be found useful in reducing the viscidity of the secretion and cleansing the mouth. The drinking of lemonade will serve a similar purpose, and will be found refreshing. Acids, however, antidote certain remedies.

The diet should consist of milk with a slight addition of salt, nutritious soups, and soft food.

Aconitum.—Throat sore, dry, burning red. Stinging, pricking pains. Useful in acute inflammation ; rarely indicated after infiltration or exudation has taken place.

Ammonium muriaticum.—Throbbing in the tonsils. The throat is so swollen that the patient can not open his mouth. The mouth and throat are filled with a viscid phlegm, which can only be expelled with great difficulty.

Amygdala persica.—Dark red color of the fauces, uvula, and tonsils, with sudden sharp pains, causing considerable difficulty in swallowing. There is marked general prostration.

Apis mellifica.—Tonsils swollen, bright red, and present an erysipelatous and œdematous appearance. Throat swollen, inside and outside ; breathing and swallowing difficult.

Baryta carbonica removes the tendency to tonsillitis, particularly in strumous children, in whom the slightest exposure to damp or cold weather awakens anew the inflammation of the tonsils. Smarting pain when swallowing, worse during empty swallowing than when swallowing soft food. Submaxillary glands swollen, indurated.

Belladonna.—Adapted to the first stage of tonsillitis. Throat is swollen and constricted, feeling as if too narrow when swallowing. Throat feels raw, sore, and dry ; looks very red and shining.

Guaiacum.—Tonsillitis, worse on right side ; throat is dry ; stinging pains in throat, worse in warm, moist air.

Hepar sulphurus calcareum is indicated in tonsillitis when Belladonna or Baryta carbonica have not succeeded in reducing the inflammation before suppuration commences. Swelling of the tonsils and cervical glands ; sticking as from a splinter on swallowing, extending towards the ear. Great sensitiveness to the ear, or even chilliness.

Lachesis.—Tonsils swollen, with tendency to extend from left to right ; throat looks bluish-red ; inability to swallow, sensation of threatening suffocation ; excessive sensitiveness ; can bear nothing about the throat ; worse in the afternoon, after sleep, and can not bear anything to touch the neck.

Lycopodium.—Tonsillitis, going from right to left ; difficult swallowing ; sensation of lump in throat, associated with dyspepsia. Large tonsils, studded with small indurated ulcers. Not useful in suppurative tonsillitis.

Mercurius solubilis is indicated when pus has already formed, the enlarged tonsil encroaches on the neighboring parts, and the breathing is labored. Tonsils dark red ; stinging pains in throat, worse from empty swallowing and at night ; fetid ptyalism ; very offensive smell from the mouth ; swollen, flabby, thickly coated tongue.

Mercurius iodatus ruber.—Dark red and swollen tonsils, and swollen submaxillary glands. *Left* side, like Lachesis ; both have pains on swallowing extending to the ear, but Lachesis has ess fever and marked aggravation after sleep.

Mercurius iodatus flavus.—Tonsillitis, usually beginning on right side, associated with coated tongue, thick yellow at the base. Much tenacious mucus in throat, difficult to dislodge and causing retching.

Phytolacca decandra.—Tonsils dark red, almost purple; dry, rough, burning, smarting feeling in fauces; great burning in throat, with aggravation from hot drinks. Great prostration, aching in the limbs and back, stiffness of the neck, headache and vertigo.

Silica.—When the tonsils have suppurated and discharged and refused to heal, especially indicated in rhachitic children. Sharp, sticking, pricking pains in throat, as from a pin, worse towards evening.

Sulphur.—Stitches in throat, when swallowing, extending to the ear. When Silica fails in the process of resolution a few doses of Sulphur generally has the desired effect.

HYPERTROPHY OF THE TONSILS.

This affection, though sometimes congenital, is most frequently developed at about the age of puberty. In some cases the disease may exist without giving rise to inconvenience or evil effects, persisting into adult life; but as a rule, especially in early life, the conditions are such as to require prompt attention. After the age of puberty there is a tendency of the hypertrophied tonsils to decrease in size.

Repeated acute congestions of the tonsils or of the pharyngeal mucous membrane, whether simple or symptomatic of scarlet fever or diphtheria, tend to produce an enlargement not only of the faucial tonsils, but of the adenoid structures, in children. In many cases this hypertrophy may be present in subjects who have rarely or never suffered from sore throat, but in whom the cause of the enlargement must be regarded as a manifestation of the strumous diathesis.

Hypertrophy of the tonsil consists of an equable and uniform overgrowth of all the histological elements of the gland. The lymph follicles are increased in size and number, the lacunæ are dilated and their walls thickened, the diffuse adenoid tissue is increased, and the connective tissue is more or less hypertrophied. In some cases the lacunar orifices may be enlarged and gaping, but frequently the lacunæ are narrowed or completely closed as the result of the superficial inflammatory process, which is also accountable for the production of small bands of tissue bridging over the lacunar orifices. The cavities of the lacunæ are filled with a viscid mucus, which in some cases becomes condensed into matter of a caseous consistence. This cheesy matter consists of desquamated scaly epithelium, lymph corpuscles, and numerous as well as various kinds of micro-organisms, which matter, in course of time, may become calcareous.

The variety of tonsillar enlargement which is observed especially in young children is the *soft* or *lymphoid hypertrophy*, in which there is a coincident hypertrophy of the pharyngeal tonsil (adenoid vegetations). The tonsils are pale, soft, and somewhat flattened, projecting but little beyond the faucial pillars. These soft tonsils may diminish in size after puberty; but if, in consequence of repeated inflammatory attacks, they become indurated, they pass into the *firm* or *fibrous* form of hypertrophy which is observed in older children and in adults. The fibrous tonsil is red, of a firm consistence, and forms a globular and often pedunculated tumor which may project so far as to interfere with breathing. The hard fibrous tonsil manifests little tendency to decrease in size.

Though both tonsils are generally affected, usually one gland is more enlarged than the other. Moderate enlargement may occasion no inconvenience or symptoms, but when the enlargement is marked it leads to interference with respiration, voice, and hearing. The diseased condition of the surrounding parts generates a catarrhal condition of the nose, and breathing is carried on through the mouth, which is kept constantly open, giving to the features a stupid expression. The breathing is noisy, especially when eating or drinking, and when asleep the patient snores, and the sleep is usually very disturbed. The voice is thick, indistinct, and devoid of resonance, and in some cases there are disturbances of hearing, through involvement of the Eustachian tube.

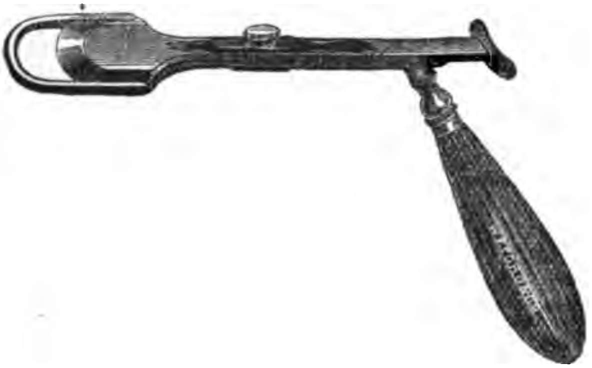
If the tonsillar enlargement becomes marked at an early age the obstruction to the free entrance of a sufficient supply of air into the lungs may lead to a deformity of the chest, called "pigeon-breast." In these cases the constant energetic contractions of the diaphragm to overcome the obstacles to free respiration forces the yielding costal cartilages inward, thus flattening the thorax laterally and causing projection of the sternum. There may be, also, narrowing of the nostrils, diminished growth of the upper jaw with greater concavity of the hard palate, the teeth being pressed closely against one another.

There is seldom *pain* in swallowing, but there is an uncomfortable sensation of a foreign body, and a tendency to hawk and clear the throat. A troublesome hacking or barking cough is also frequently present, which comes on in paroxysms at certain regular intervals.

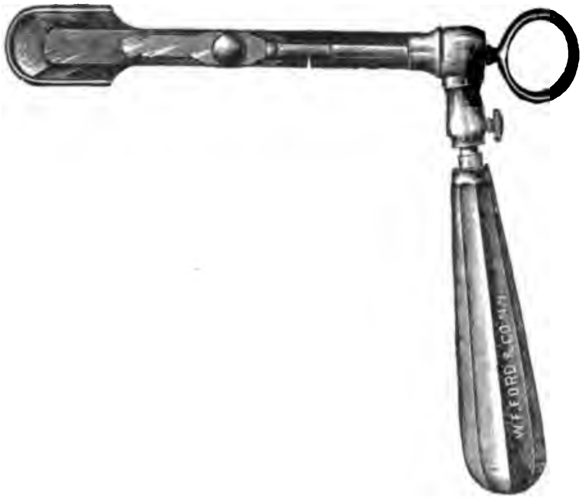
Diagnosis.—On examination of the pharynx the increased size, and often the diseased surface, of the tonsils will be seen. Sometimes the enlarged tonsils will project into the pharynx, leaving the faucial pillars free; in other cases the tonsils will present a flattened appearance, not projecting beyond the pillars, to which they are more or less adherent. The surface of the tonsil may be uniform and smooth, or it may be jagged and irregular by reason of the deep clefts which may divide the tonsil into lobes, presenting a honey-combed appearance. The orifices of the dilated lacunæ are frequently filled with cheesy plugs. The lymphatic glands below the angle of the jaw may sometimes be enlarged.

Treatment.—Moderate hypertrophy of the tonsils, giving rise to no symptoms or inconvenience, need not be interfered with. When, as in certain cases, the hypertrophied condition of the tonsils predisposes to repeated inflammatory attacks, active treatment is called for. All measures of local applications and injections into the substance of the gland to effect a diminution in the size of the tonsil are useless. The most effectual and satisfactory treatment is removal of the tonsil with a tonsillotome. This method is applicable for the removal of the soft or lymphoid variety. If the patient is an unmanageable child an anæsthetic should be given, and before the tonsil is excised the adhesions, should any exist between the hypertrophied tonsils and the faucial pillars, should be separated by a hook with a dull cutting edge. Freeing of the pillars from these adhesions enables the operator to thoroughly remove the redundant tonsillar tissue, and the pain and much of the troublesome hemorrhage are avoided if the pillars are not wounded by the tonsillotome.

The choice of the instrument lies between Matthieu's and Mackenzie's tonsillotomes. Mandeville's modification of Mackenzie's amygdalotome is so arranged that the blades can be



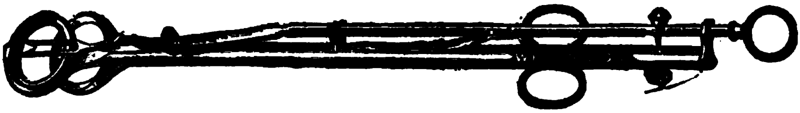
Mackenzie's Tonsillotome.


W.F. FORD & CO. N.Y.

Mandeville's Tonsillotome.

readily turned and made adaptable for operation on either tonsil, so that when both tonsils are to be removed the instrument can be quickly reintroduced on the opposite side before hemorrhage sets in. Three sizes should be at hand.

The recumbent posture is most suitable for patients under anæsthesia. In children adenoid disease usually coexists and requires removal. Unless contraindicated, operations for the removal of the hypertrophid pharyngeal tonsil may be made at the same time the faucial tonsils are excised. The amygdalotome should be introduced back far enough so as to completely encircle the tonsil, and the ring is to be passed over the lower end of the tonsil first; with the index finger ascertain that the gland is embraced by the ring. If the aperture of the tonsillotome is a little smaller than the gland the latter can, by pressure, be more completely enclosed and fixed before the cut is made.



Matthieu's Tonsillotome.

Hypertrophied tonsils of the hard or fibrous variety are best removed by means of the écraseur; by this method there is practically no bleeding. Dangerous hemorrhage has occasionally followed ablation by the amygdalotome. The écraseur should be strong, and No. 5 or 7 piano wire used for the loop.

The employment of the galvano-cautery puncture may be necessary in those cases where the patient resolutely objects to the operation of excision, and without doubt it is the best means for the removal of those tonsils which are broad, flat, and deeply embedded between the faucial pillars. This method should be adopted on all patients with a hemorrhagic tendency. Its use is attended by no hemorrhage, the parts acted upon being cauterized most effectually. Though the process is somewhat tedious, it can be used with safety where the employment of the knife would be inconvenient or dangerous. The point of the electrode should be introduced to the bottom of the crypt, the current is then to be turned on, burning out to the surface of the tonsil. If the point can not be inserted into a crypt, it may be plunged into the tonsil when at a cherry-red heat, and then withdrawn at the same opening. It is advisable to treat only one tonsil at a sitting, and to avoid extensive cauterization. Burning of the faucial pillars should be guarded against. An application of ten per cent. solution of cocaine should be made before using the cautery.

All operations for the reduction or removal of an acutely-inflamed tonsil are to be deprecated except when, from extraordinary swelling, there are symptoms of impending asphyxia.

The majority of cases of alarming hemorrhage after removal of the tonsils have occurred in the adult, and a large proportion of these serious hemorrhages have been secondary. In hæmophilia, and where there is suspected or apparent vascular anomalies, cutting operations are contraindicated. If the bleeding does not begin to subside after three or four minutes it is desirable to find its source, seize the bleeding vessel with a torsion forceps, and twist it. It is advisable to insist upon a fluid diet, to restrict exercise, and to prohibit the use of the voice for three or four days after the operation. Secondary hemorrhage is usually controlled by Styptic of formula 8, or by the use of Dr. Mackenzie's tanno-gallic acid gargle:—tannic acid, three drachms; gallic acid, one drachm; water, one ounce. The patient should have one-half teaspoonful at frequent intervals.

An infusion of Chamomile flowers, or Calendulæ officinalis, one drachm to water one ounce, used as a mouth-wash, will relieve the soreness following tonsillotomy.

Baryta affects especially the parenchyma of the tonsils. It is particularly useful where there is a liability to tonsillitis after every slight cold; it removes the predisposition to tonsillitis and cures chronic enlargement of the tonsils. Dr. Hale states that the Carbonate and Muriate of Baryta act best in acute tonsillitis, and that **Baryta iodide** is better adapted to the resulting hypertrophy with *induration*.

Consult **Calcarea carbonica, Calcarea iodata, Calcarea phosphorica**, and **Calcarea sulphurica**; **Mercurius iodatus ruber, Mercurius iodatus flavus, Lycopodium, Phytolacca**, and **Sulphur**.

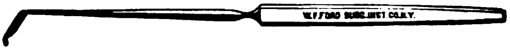
CHRONIC LACUNAR TONSILLITIS.

In chronic lacunar tonsillitis the tonsils are more or less enlarged, but not to a marked degree. This complaint is apparently caused by an occlusion of the orifices of the crypts and the accumulation of a cheesy-looking, ill-smelling mass, consisting principally of fatty matter, cholesterine, and numerous micro-organisms. The retention of this material is a source of irritation, and predisposes to active inflammation causing enlargement. These masses vary in size from a millet seed to a pea, and have a disagreeable odor. In some cases they cause a tickling or pricking feeling, and sometimes a troublesome cough, especially in the morning. These cheesy plugs are expelled from time to time, being aided by the muscular contractions in deglutition.

On examination one or more yellowish-white spots may be seen occupying the lacunar orifices. In some cases it may be necessary to introduce a ring-probe to bring to view these cheesy masses. The large crypt, which can be exposed by retracting the anterior pillar, should be explored, as well as the upper extremity of the tonsil between the pillars, which are favorite sites for the deposition of this cheesy matter.

The occasional appearance of a cheesy plug causes no inconvenience; it is only when it becomes a chronic process that it gives rise to pain, swollen tonsils, a little fever, and symptoms of local disturbance that treatment is invoked.

Treatment.—When the tonsils do not require excision, the crypt walls may be opened with a hook-shaped knife, when the cheesy masses can be readily evacuated. If necessary several crypts may be opened at one sitting. To prevent the union of the cut surfaces, an application of the following antiseptic solution should be made to each crypt which has been opened:



Douglass' Tonsil Knife.

Iodine and Potassium iodide, eighty grains of each to water, one ounce. Adhesions between the tonsils and faucial pillars should also be divided.

CALCULUS OF THE TONSIL.

The retention, inspissation, and finally calcification of the cheesy masses in the tonsillar crypts is the causation of calcareous concretions in the tonsil. Small concretions and sandy particles are of frequent occurrence, but in some instances calculi have been met with as large as a cherry. The shape of the calculus varies much, and its composition is almost wholly carbonate and phosphate of lime. Gruening has stated that all tonsillar and pharyngeal concretions are of parasitic origin, and are originated by the leptothrix elements, around which as the nucleus is accumulated the degenerated mucus and epithelial matter, becoming calcareous.

The symptoms are not prominent. A slight pricking sensation in the throat is complained of; if the concretions are numerous, or large, there may be dysphagia. Sometimes a dry hacking cough is present.

Diagnosis.—Small concretions are sometimes spontaneously discharged from the tonsil. The presence of calculi can be readily recognized by the projection of the whitish concretion from the cryptic orifice, or it can be felt with a probe.

Treatment.—The calculus should be removed with a ring-probe or forceps. If there is any considerable hypertrophy of the tonsil, it should be excised by means of the cold wire snare.

Chronic inflammation of the crypts of the faucial tonsils is not detected as frequently as it should be, because of the difficulty of thorough examination of these parts. In some of these cases the tonsil does not project beyond the pillars, to which the tonsil is often adherent, either totally or partially, anteriorly or posteriorly; but the tonsil is none the less diseased, because the crypts are often found to be filled with a caseous mass containing many leptothrix filaments, and easily develop inflammatory processes.

The best method of treatment in these cases is to dissect out the tonsil from its adhesions, with either a suitably curved knife or scissors, or the galvano-cautery, and then remove the diseased tissue by the galvano-cautery.

TUMORS OF THE TONSIL.

Benign tumors of the tonsil are generally papillomatous in structure, and are most frequently found on the faucial pillars, the tonsils, or posterior wall of the pharynx. They appear as warty growths, with irregular outlines; they may give rise to little or no trouble until their increase in size may produce considerable irritation. They may vary in size from that of a pea to a large mass, are usually pedunculated, and are always painless.

They are easily removed by means of a cold snare or the galvano-cautery snare, cutting close to the healthy membrane.

MALIGNANT NEOPLASMS.

Cancer of the tonsil is seldom observed until after the fortieth year. One or both tonsils may be affected, though the disease is generally unilateral. It is usually of primary origin, but it may occur as a secondary affection. Of the malignant growths epithelioma and sarcoma are the two most common forms.

Epithelioma usually begins as a small nodule, with slight irregularity of surface, and to the examining finger imparts a fixed, indurated feeling. This nodule soon breaks down into an ulcer which is deep, with hard, raised margins, and is covered by a yellowish-grey *débris*. The soft palate, palatine arches, and cervical glands are invariably involved. Pain, of an intermittent and lancinating character, darting in the direction of the ear, which is increased but not induced by swallowing, is usually an early and pronounced sign.

Of the Sarcomata the round-celled variety is the most malignant. They are rare in old age, occurring chiefly in children and adults under thirty years of age. The growth is red and soft, and does not ulcerate until it has attained considerable size. It tends to invade the structures in the immediate neighborhood, and the loss of flesh is generally rapid. In the spindle-celled variety of sarcoma the tumor may remain encapsuled for a considerable time, and the glands continue unaffected.

Epithelioma has been confounded with a primary syphilitic sore on the tonsil, and it is often difficult to diagnose malignant disease from tertiary syphilitic ulceration. The fixity and induration of the parts, the cervical glandular enlargements, and negative effects of anti-syphilitic treatment will assist to establish the diagnosis. When there is doubt the diagnosis should be confirmed or refuted by a microscopical examination of a portion of the growth.

The **prognosis** is unfavorable. However, many recorded cases prove that a radical operation, when undertaken in the early stage of the disease, has been successful. In most cases palliative treatment alone is possible, as the disease may be well advanced before the patient seeks advice.

ELONGATED UVULA. CHRONIC RELAXED THROAT.

This affection is generally the result of chronic catarrhal conditions of the pharynx. Common causes of relaxed throat are excessive use of tobacco or alcohol, gastric derangements, general depression and enfeeblement; sometimes it is congenital. Cerebral affections and diphtheria, by causing paralysis of the soft palate, may cause it to appear relaxed. Any cause which may produce a relaxation of the velum palati will be followed by elongation of the uvula. Though in some cases an apparent elongation may cause little inconvenience, it commonly aggravates the unhealthy condition independently of the exciting causes which originated the trouble. In mild cases there is merely relaxation of the soft palate and uvula, the parts otherwise remaining normal in appearance. In more severe cases there is chronic congestion and hypertrophy of the velum palati and fauces. Concurrently there is often an engorged and varicose condition of the veins at the base of the tongue, and hypertrophy of the lingual tonsil.

Symptoms.—The ordinary sensation of a desire to frequently clear the throat of a source of irritation predominates at certain intervals—as, on rising in the morning, the transition from a cold to a warm atmosphere, and also from general fatigue. When the uvula is sufficiently elongated to reach the larynx spasm of the glottis occurs in consequence; great distress and severe paroxysms of coughing will be felt as the patient lies down at night; constant titillation at the back of the tongue not infrequently results in vomiting, especially after meals. The concurrent hyperæsthesia of the pharynx exposes the patient to sudden attacks of violent spasmodic cough upon the slightest, or sometimes without any apparent, provocation. The cough, loss of sleep and appetite, and retching or vomiting may result in such weakness, emaciation, and debility that the patient may be brought to a state of great nervous prostration.

The bad effects of relaxation of the soft palate and uvula upon the voice, chiefly in professional singers, are observed in its impairment of quality and strength. The larynx always participates in the general condition of the throat; it is usually congested, which is due to the constant irritation of the cough; the voice becomes hoarse and much weaker than natural. Labus has demonstrated that the cause of this vocal enervation was due principally to a paretic condition of the elevators and tensors, which prevented the necessary movements of the soft palate that are requisite for the formation of various tones.

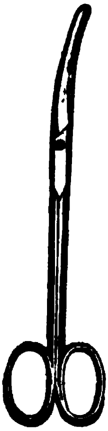
Diagnosis.—Careful examination will determine the actuality of a relaxed throat. In the healthy throat, on inspiration or when singing a high tone, the uvula is almost entirely retracted into the soft palate, which is also drawn up; under similar circumstances the relaxed uvula is but partially retracted, possibly in wrinkles, and soon falls, to rest on the back of the tongue. The length of the uvula can be estimated by directing the patient to breathe through the nostrils, which will effect a relaxation of the palate. In relaxed throat the redundant mucous membrane on the free edges of the soft palate and the tip of the uvula, it will be observed, is thin and quite translucent.

Treatment.—In the milder cases of relaxed uvula, or when the relaxation involves only the soft palate, it is advisable to give local astringent applications a reasonable trial. Alum, grs. xx; water, one ounce; Tannic acid, fifteen grains to water, one ounce; Ferri perchloridi, twenty to ninety grains, to water, one ounce; Zinci chloridi, ten to thirty grains, water, one ounce. If local applications should prove unsuccessful, the simple operation of abscission of the redundant portion of the uvula should be performed.

Local anæsthesia having been secured by the application of a solution of cocaine, from five to ten per cent., the uvula should be drawn forward with a pair of long forceps and the redundant portion abscised with uvula scissors at a point just below the tip of the azygos muscle. Too complete removal of the uvula has been followed by very undesirable circumstances. The patient's tongue may be pressed down with a tongue depressor, held by himself or by an assistant. Operation with scissors is in every way preferable to the use of the uvulatome.

By cutting obliquely upward and backward better results generally are obtained; the healing is rapid, the stump is better, the cut surface is situated posteriorly, and there is less pain and difficulty in swallowing. As a rule, there is little bleeding. If hemorrhage results it can readily be checked by the application of a strong solution of tannic acid or gallic acid. The healing process is facilitated by occasionally gargling with Succus Calendulæ and water, one drachm to the ounce.

Highly-seasoned food, hot and acid liquids, and the use of tobacco should be avoided. In two days the reparative process is quite complete.



Uvula Scissors.

When there is hypertrophy of the adenoid tissue and varix of the vessels at the base of the tongue, they should be destroyed with the galvano-cautery point.

Affections of the uvula and soft palate are usually associated with inflammatory conditions of the pharynx or fauces; occasionally acute inflammation of the uvula may arise from sudden exposure to cold, or to the ingestion of too hot food or drink, irritating alkaline substances, or mineral acids. Traumatism of any kind may produce this affection.

The symptoms are sensation of a foreign body in the throat, pain and sensitiveness, aggravated during deglutition, and sometimes dyspnœa because of the intense swelling.

In severe cases the inflammation involves the mucous membrane and the submucous connective tissue, causing œdema, and gives rise to prolapsus which is attended with great discomfort; frequently, however, in acute œdema, the enlargement is greater in bulk than in length. Œdema of the uvula is frequently seen in tertiary syphilis and in phthisis. Follicular and herpetic inflammation of the uvula are commonly associated with a similar condition in the pharynx.

The symptoms of acute uvulitis are usually temporary. It may become chronic if the inflammation is oft-repeated, or when the general nutrition has become impaired—in strumous and anæmic subjects—when it is often associated with a chronic pharyngitis.

It is inadvisable to amputate the uvula while in the acute stage of inflammation. In aggravated cases of acute œdema a few punctures, or a slight scarification, will give instant relief. For no reason should the uvula be amputated if the œdema be due to syphilis.

Aconite.—Soft palate and uvula burning red; feeling of dryness, with stinging, pricking, and burning in throat. Constriction in soft palate and uvula, with scratching, causing hawking. Aconite is rarely, if ever, indicated after infiltration has taken place.

Alumina.—Dryness and irritability; relaxation of the uvula causing a persistent tickling cough, with constant inclination to clear the throat. Rawness, roughness, and scraping, with pressure in throat as from a plug.

Belladonna.—Deep redness and great dryness in mouth and throat, not relieved by drinking water; glazed dryness. First stage of sore throat. Throat swollen and constricted, with difficult swallowing.

Cantharis.—Relaxation of uvula. Constriction, burning soreness, and intense pain at back of throat; it feels "on fire."

Capsicum.—Relaxed uvula; throat sore and contracted even when not swallowing. Burning, and continuous stitches in the throat, exciting dry, convulsive cough. Useful in sore throat of smokers and drinkers.

Hyoscyamus.—Soft palate relaxed. Great dryness and constriction, impairing swallowing. Difficult to swallow liquids.

Mercurius corrosivus.—Uvula swollen and elongated, with dark redness of pillars of soft palate. *Burning* pains (like Arsenicum). Swallowing, even of fluids, painful. (The topical application of the first trituration of this remedy to the affected uvula will often effect a contraction of the tissues.)

Phosphorus.—Uvula swollen and elongated; feeling of dryness, roughness, and burning in the fauces. Rawness and scraping in the pharynx.

Consult **Coffea, Crotum tiglium, Lachesis, Nux vomica, Natrum muriaticum.**

DIPHTHERIA.

Diphtheria is an acute, specific, infectious, and contagious disease, preferentially affecting the mucous surfaces of the upper portion of the respiratory tract; also, but more rarely, affecting abraded cutaneous surfaces. It appears first as a local disease, the part attacked being the seat of an inflammatory process, and is characterized usually by the formation of a false membranous deposit. The system as a whole is secondarily affected, the general disease being a consequence of the local one. The disease occurs solitarily, endemically, and epidemically, and is most frequent in temperate climates, being most common in cold, raw, damp weather; large cities are rarely free from it. Diphtheria may occur at any age, but is most frequent in children between two and eight years of age. Nursing children are rarely affected. It sometimes occurs as a secondary disease in measles, scarlet fever, small-pox, and typhoid fever.

Careful observers have proven that the *Klebs-Löffler bacillus diphtheriæ* is essentially the specific cause of the local disease, and that the general symptoms of diphtheria are largely due to the absorption into the system of a chemical poison or toxin, which is the result of the development of these organisms. Several other pathogenic bacteria are associated with the Klebs-Löffler bacillus in diphtheria—staphylococci, streptococci, and other saprophytes—which, if not originally present, develop rapidly in the necrotic nidus, and, by absorption, produce the profound toxæmia of the disease. The development of the disease is undoubtedly dependent upon the deposit of the diphtheritic virus on a surface which is eroded or more or less inflamed. The specific diphtheria bacilli may be present in a healthy throat for a variable period, with no ill result, until the manifestation of an inflammatory attack or a slight traumatism favors the development of the disease. The bacillus which is contained in the pseudo-membrane and in the secretious of the mouth, throat, and nose of patients suffering from the disease may be conveyed directly from the patient in the act of sneezing, coughing, gagging, or vomiting, or indirectly through the medium of hands, articles of clothing, handkerchiefs, books and playthings. Outside the body the vitality of the diphtheria germs is very persistent, and may extend for some months, especially if protected from light and air.

Impure water and contaminated milk may prove important agents in the spread of the disease. Milk may be infected by those engaged in the farm or dairy, or from a diseased condition of the cow's udders and teats. Cats, dogs, rabbits, and pigs have also been known to suffer from an infectious disease resembling diphtheria. Though the specific bacillus of diphtheria has never been discovered in sewer gas, there are a certain number of cases, occurring solitarily, which do not seem to have become infected from pre-existing disease, and for which no explanation is adduced, unless it be concluded that in rare instances diphtheria may be induced by faulty sanitary surroundings, or where the drains have been contaminated with the specific virus of the disease. Faulty sanitary conditions, therefore, may induce sore throat, which may be most favorable to the reception and growth of the diphtheria bacillus.

As all who come in contact with the germ or poison do not have diphtheria, an individual susceptibility and predisposition are evidently prerequisites. Individuals affected with an acute or chronic inflammation of the throat, hypertrophy of the tonsils, ulcerous lesions of the nose, lips, or mouth, are more likely than persons not so affected to contract diphtheria. In young children the nasal cavities are small, and are frequently the seat of a congestive and inflammatory process. A chronic inflamed condition of the faucial tonsils renders the patient susceptible to the poisonous influence of the virus. When the disease is endemic it seldom attacks those who live in healthy and well-ventilated houses. In the epidemic form, however, it manifests no respect for social rank or wealthy surroundings. The contagion of the disease is at its highest degree when the false membranes are present, and eminently so during convalescence, when the diphtheritic products are cast off. Even when the false membranes have disappeared, the saliva of the patient may contain the bacillus with all its virulence; hence convalescent patients may be a source of danger to persons who come in contact with them. One attack insures no exemption or immunity against another.

All specific bacilli obtained from the throats of diphtheritic patients are not endowed with the same virulence; this is easily proved by inoculations of liquid cultures in animals. In malignant or fatal diphtherias all the colonies that may be used for purposes of inoculation are found to be very virulent; in the severe form the colonies become less numerous as the disease progresses towards recovery, while in the mild form—benign diphtheria—the bacilli are usually much less active. The bacilli do not invade the economy to any extent; the constitutional disturbances are due to the systemic poisoning by the products of the diphtheria bacillus, and to similar infections by other pathogenic bacteria, whose association may complicate the disease.

Symptoms.—The duration of the prodromal stage is generally from one to three days, but exceptionally from twelve to fifteen days. In young children the onset may be sudden; in older children and adults the invasion is more gradual. The symptoms of diphtheria may vary from those of a slight sore throat to those of the most malignant form of the disease. For convenience of description the varieties of the disease may be classified as follows: I. The mild or catarrhal form; II. The severe or typical form; III. The malignant or septic form.

I. In the mild or catarrhal form of the disease the mode of onset is often obscure. The early symptoms may be merely those attendant upon an ordinary sore throat, with feeling of malaise, headache, anorexia, some nausea, pain in the back or limbs. The throat feels dry and hot, and there is slight pain on swallowing. During the development of the local manifestations the submaxillary and cervical glands may become swollen and tender, considerable pain and difficulty in swallowing, and a rise in temperature to 101° or 102° Fahr. The fauces will be found to be red and swollen, and the tongue is covered with a thick white coating. After a day or two minute grayish-white spots, about the size of pin-heads, appear on the surface of one or both tonsils, faucial pillars, or soft palate; these rapidly increase in number, and, by coalescence, forms a curd-like exudation on the surface of the mucous membrane. When this false membrane is detached, either artificially or spontaneously, the mucous membrane appears red and swollen, upon which a fresh, less extensive, and thinner membrane is reproduced. At the end of six or eight days there is an improvement of the local condition, the false membrane ceases to re-form, the fever decreases, the appetite returns, but the debility may be considerable and persistent. Albuminuria is generally lacking; paralysis sometimes appears, however, during convalescence. Some cases of this benign form of the disease may give rise to the more severe form, which in a few days breaks out in full force.

II. In the severe or typical form the symptoms are more pronounced. There is high fever (the temperature rising to 103° or 105° Fahr.), severe sore throat, extreme depression, violent headache, nausea, sometimes vomiting, and occasionally delirium. The patient will complain of dysphagia, and the neck will be swollen, stiff, and tender. The mucous membrane on the palate, the faucial pillars, and the tonsils will be found intensely hyperæmic, swollen, and œdematous, upon which, in a few hours, appear small grayish-white patches, rapidly developing into a thicker, drier, and darker membrane. If this membrane is removed the epithelium comes with it, leaving an eroded or ulcerated surface, which bleeds easily and sometimes profusely. The submaxillary, parotid, and lymphatic glands are swollen, hard, and sensitive to pressure, and the soft tissue about them may be more or less infiltrated.

Fever is generally lessened with the extension of the exudation; sometimes it may remain stationary, or even increase as the local process develops. When a further rise of temperature occurs during the course of the disease, it may indicate, in favorable cases, suppuration and separation of the false membrane; or in others an extension of the morbid process to the nasal fossæ, the larynx, or other parts. If it extends to the nasal cavities it is marked by an ichorous, mucopurulent discharge, which is peculiarly irritating, and erodes the nostrils and upper lip, with the formation of false membrane in the nasal cavities, which is generally most abundant posteriorly. Epistaxis frequently occurs, which may be very profuse and lead to fatal results. If the larynx and trachea are invaded (which is more apt to occur in young children and adults) the voice will be hoarse and muffled, and stridulous breathing, and the characteristic "croupy" cough; later there will be dyspnœa, increasing cyanosis, and drowsiness passing into coma. The false membrane may obstruct the lachrymal duct, causing epiphora; or the disease may extend by this channel to the conjunctiva. Ocular diphtheria, however, is quite rare. If the morbid process extends into the Eustachian tube there will occur ear-ache, suppuration, perforation of the membrana tympani, and a subsequent purulent discharge.

The patient usually experiences great difficulty in discharging the viscid secretion which is constantly accumulating in the mouth, and there is extreme fetor of the breath due to the decomposition of the morbid secretions in the throat. There is anorexia, and the stomach is disturbed. Although vomiting is unusual and the bowels are constipated, there may be vomiting and diarrhœa, which is caused, probably, by the swallowing of the ichorous matters produced in the throat. The urine is generally scanty and high-colored. At the commencement, or at some stage of the disease, it will be found to contain albumen; the amount present is not constant, and is subject to considerable daily variations, and as a rule need cause no undue anxiety.

Microscopic examination of the urine reveals lithates and phosphates, epithelium, hyaline or fibrinous casts, and red and white blood corpuscles.

In cases which progress toward recovery the false membrane is exfoliated and no new membrane is reproduced; the fever and other symptoms disappear with the improvement in the local condition. But a relapse may occur, which sometimes proves to be more severe than the initial attack; or convalescence may be interrupted by syncope or paralytic symptoms of more or less gravity. If the attack terminates unfavorably, death may occur from secondary blood-poisoning, with typhoid symptoms or coma, or from cardiac embolism or syncope.

III. The onset of the malignant or septic form of diphtheria may be sudden and severe, or it may develop out of the milder forms, during the course of which the products of decomposition have entered the blood, producing a condition of septicæmia. In such cases there are rigors, severe headache, vomiting, and sometimes profuse hemorrhage. The entire throat speedily becomes covered with thick yellowish-white membrane; the submaxillary and cervical glands rapidly enlarge, there is excessive infiltration of the neighboring cellular tissue, and the whole neck becomes greatly swollen. Deglutition is involuntarily suspended, ichorous and foul-smelling secretions are discharged from the mouth and from the nostrils, by which the lips are excoriated, and on these erosions grayish-white patches of false membrane form. Extravasated blood mingles with the decomposing exudation, giving it a brownish appearance, or escapes freely from its under surface, giving rise to more or less serious hemorrhage. Though the temperature may rise high, it sometimes subsides to normal or subnormal as the signs of prostration and collapse increase. The pulse is small, weak, compressible, and very irregular; the face pallid and puffy; the skin becomes cold; the tongue is brown and tremulous, and the breath fetid; nausea, vomiting and diarrhœa are usually present; the scanty urine is loaded with albumen, the strength is exhausted, and the mental condition is one of lethargy. The extreme restlessness and agitation are soon followed by impaired consciousness, slight delirium, or deep somnolence. Death from collapse or syncope usually occurs at the height of the affection—within a few days or a week.

When the malignant form develops out of the milder form two or three weeks may elapse before death occurs, from cardiac paralysis, after entire recovery from the local affection. Purpuric spots occasionally occur in various parts, either widely distributed or grouped together. When recovery does take place, convalescence is necessarily very slow.

PHARYNX. The earliest evidence of the disease is most frequently found within the lacunæ of the tonsil, or deposited on its inflamed and turgid surface. The tonsils are enlarged, and they in common with the whole of the pharynx, the palatine arches and the uvula are congested and unequally turgid; one side is generally the most affected. Some of these parts appear more swollen than others, and spots, at first semi-transparent and afterwards opaque, rapidly form and coalesce, so that in a few hours a large surface may be covered with a continuous layer of exudation; in some cases the exudation may be limited to one or more centres, the adjacent mucous membrane being elevated and deeply inflamed, until it is invaded by the same change. The exudate gradually becomes yellowish, dirty-brown, or grayish-black in color, tougher in consistence, much thicker and firmly adherent.

NOSE. The nasal cavities may be invaded primarily, or the disease may extend from the pharynx or posterior aspect of the soft palate, especially when the uvula is affected. Nasal diphtheria is more common amongst children with adenoid growths; in such cases the disease spreads rapidly, and the interference with breathing is likely to be extreme. The inflamed mucous membrane discharges a sero-mucus, often very offensive and sanguinolent, which excoriates the skin of the upper lip. The voice is muffled or nasal in tone. Respiration is more or less impeded from the physical obstacles without laryngeal symptoms arising; on this account, and also because of the great danger of septic infection, diphtheria of the nasal fossæ is regarded as very unfavorable.

EYE. The eye may be infected primarily, or the specific bacillus may pass from the nares through the nasal duct. Ocular diphtheria is, however, quite rare.

EAR. Through the medium of the Eustachian tube, otitis media and interna, with an obstinate otorrhœa may result, with great destruction of the membrana tympani.

The cervical glands, especially the submaxillary lymphatic glands, increase in volume; a large amount of serous infiltration takes place in the surrounding cellular tissue, and the whole of the front of the neck becomes greatly swollen. Rapid swelling of the deep glands at the angle of the lower jaw is considered an important diagnostic in nasal diphtheria.

LARYNX. Diphtheria may commence in the larynx by independent centres of deposit and extend upwards or downwards, or by the spread of exudation from the pharynx to the epiglottis, over the arytæno-epiglottidean fold, and thence downwards into the bronchi. The disease often affects the epiglottis, the margin of which is swollen and reddened, interrupted here and there by small diphtheritic deposits, which generally coalesce to form a continuous membrane. Sometimes isolated diphtheritic deposits are found on either side of the attached extremity of the epiglottis. In all cases there is hoarseness and more or less dyspnœa, and, if there be œdema, a functional paralysis of the vocal bands. Invasion of the larynx is indicated by hoarseness, or weakness of the voice; by signs of impeded respiration evidenced in the œdema of the face and livid hue of the lips; by the retraction of the softer parts of the thoracic parietes, and gradually deepening unconsciousness.

LUNGS. The lungs may become affected during an attack of diphtheria, by aspiration of fragments of false membrane into the capillary bronchi, causing lobular pneumonia. Bronchopneumonia is often the consequence of tracheotomy.

MOUTH. Diphtheria of the mouth usually appears as a secondary manifestation of the disease in the fauces and nose, and occurs where the mucous membrane of the mouth was eroded or ulcerated. It is of infrequent occurrence primarily. It appears on the inside of the cheeks, tongue, angles of the mouth, and gums.

SKIN. Early in the attack a more or less general erythema, very similar to and often indistinguishable from the eruption of scarlatina, may appear upon the skin over the shoulders, chest, or abdomen; it is generally of short duration, lasting but two or three days. Wounds of all kinds are easily and rapidly infected; the disease has occurred in the vulva, vagina, circumcision wounds, leech-bites, and on skin denuded by vesicatories, etc.

URINE. The density of the urine is generally high; it may be scanty and high-colored, or clear and transparent. Urea is always increased during the whole period of the illness, and is frequently doubled when the disease is at its height. Uræmia is infrequent. Albumen is present in the great majority of cases. As a rule it is not persistent after recovery, and does not often result in anasarca. In some cases it is a symptom of general nephritis, with a rapidly fatal termination. Sometimes the albuminuria is of brief duration, disappearing after twenty-four hours.

Vomiting and diarrhœa, which usually appear in the initial stage of the disease, appear later with gastralgia and great depression, and are often followed by a fatal termination.

Hemorrhage may be so profuse as to cause sudden exhaustion by the separation of exudate of unusual deep attachment, or from some dyscrasia of the blood favoring its ready transudation. Hemorrhages into the nerve centres have been the cause of instant death or hemiplegia.

HEART. The diphtheritic process may affect the heart, whether the disease has been accompanied by high fever or not, causing weakness of the cardiac muscle, and, occasionally, endocarditis, which acts upon more especially the mitral valve. The heart disturbances may be limited to temporary palpitations, tendency to fainting, and slight irregularity of the pulse; at other times there may be præcordial anguish, cardiac ataxia, compressible and soft pulse, attacks of suffocation, and syncope. These symptoms are manifested usually in the stage of convalescence, when the local symptoms have all disappeared.

PARALYSIS. In some cases paralysis may occur as a complication of the disease during the second week and subsequently, and in others it appears as a sequel, coming on from two to six weeks after the termination of the disease. Paralysis may follow the benign as well as the most severe cases. As a rule the soft palate and the muscles of deglutition are the first to be attacked, which is usually indicated by regurgitation of fluids through the nose and by nasal twang of the voice; sometimes it rapidly disappears, but in other cases the power of swallowing may be impaired for three or four weeks. In addition to the loss of muscular contractility of the laryngeal muscles there may be impairment or total abolition of sensation, causing distress of breathing and the liability of the passage of aliments into the air-tubes. Paralysis of the nerves of the special senses is not uncommon. Taste is sometimes lost, more rarely hearing; defective vision is not infrequent. Loss of muscular power may be preceded by various degrees of anæsthesia or hyperæsthesia, by numbness, tingling, formication, or a sense of coldnes, occurring in the upper or lower extremities. The lower limbs suffer most; the gait is often unsteady, and walking may be impossible from a loss of the muscular sense. In some cases it may be impossible not only to stand but to move the legs in bed. There is no muscular atrophy; the paralyzed limbs always retain their normal aspect and volume. Paralysis of the intercostal muscles and the diaphragm are of serious import.

Diagnosis.—The diagnosis depends mainly upon the demonstration of the presence of the Klebs-Löffler bacillus—the exciting cause in the membranous exudation. The characteristic sign of diphtheria is the manifestation of the fibrinous exudate, of whitish or grayish color, with more or less congestion of the surrounding parts. Swelling of the glands corresponding to the region invaded by the false membrane, the general enervation of the patient, and the albuminuria are important aids in the diagnosis. But these distinctive symptoms are not always very apparent. Albuminuria occurs in the course of diphtheria, but towards the close of scarlet fever. Paralysis, especially about the soft palate and pharynx, but occurring also elsewhere, and affecting sometimes the limbs, may come on shortly, or several weeks after, the cessation of the primary disease. These paralytic symptoms are not apparently predisposed to by the gravity of the preceding attack, but may come on after cases so slight as scarcely to attract attention. The paralysis may be motor, or sensory, or both; it is progressive and gradual, and the mind is seldom affected.

Diphtheria may be confounded with *scarlet fever*, with *lacunar tonsillitis*, and *membranons laryngitis*. The peculiar rash of scarlet fever is not a constant symptom in diphtheria; when present it appears as an erythematous blush, evanescent, and occurring in patches. The strawberry tongue and the subsequent desquamation of scarlet fever are also symptoms wanting in diphtheria. In the sore throat of scarlet fever there is an intense and diffused redness of the entire mucous membrane, and the exudation, if any, is on the surface of both tonsils and frequently on the palate, and is soft and curd-like. There is also less constitutional disturbance in scarlet fever. Early in the attack it may be difficult to differentiate lacunar tonsillitis from diphtheria. The yellowish soft secretion at the orifices of the tonsil can be more easily removed in lacunar tonsillitis without denudation of the epithelium than can the exudate in diphtheria; the lymphatic glands are not enlarged at the commencement of the attack, nor those beneath the sterno-mastoid at any time; and the amount of constitutional disturbance, the character of the pulse, the subsidence of the inflammation, or the occurrence of suppuration will soon establish the diagnosis. A bacteriological examination is absolutely necessary to remove doubts. The character of the inflammation in membranous laryngitis is sthenic; in diphtheria, asthenic. Membranous croup is sporadic and non-inoculable; the site of the inflammation is at first confined to the larynx, extending thence to the trachea and bronchi. In croup there is absence of glandular swellings, albuminous urine, and paralytic sequelæ.

Pathology.—Diphtheria is manifested by the development of a false membrane, at first thin, whitish, opaline, of rather softish consistence; later it is tough, yellowish or grayish-white, firm and elastic. This false membrane may be seated on a mucous membrane or on any part of the skin; it is found, in order of frequency, in the pharynx, larynx, nares, trachea, bronchi, Eustachian tube, conjunctiva, prepuce and vagina; it is extremely rare in the œsophagus, stomach, and intestine. The first local manifestation of diphtheritic angina appears as an inflammation, more or less intense, of the tonsils or soft palate; the epithelium swells, then its cells are glued together, the exudate being formed at first of a stroma of epithelial cells and leucocytes, finally becoming entirely fibrinous. The false membrane is composed of mucin, fatty matters, and fibrin, the last being the principal element. The false membrane cannot be detached without leaving a bleeding surface, which is rapidly covered with a new layer; it neither assists the cicatrization of the surface on which it forms, nor ever becomes itself organized. The diphtheritic exudate is renewed as long as the specific bacillus remains present and preserves its virulence. Successive exudations may give a stratified appearance to the false membrane. Changes of decomposition rapidly take place in this deposit, with injurious consequences to the neighboring lymphatic glands and to the system at large, from the absorption of effete matters.

The exudate dissolves in a few minutes if left in lime-water or in a five per cent. solution of lactic acid, and also in a solution of caustic soda and glycerine; mineral acids and acetic acid can not dissolve it.

In diphtheria of the throat it is rare not to find some evidence of lesion of the mucous membrane. Sometimes the submucous layer is bare and granular, without defined ulceration; at other times a defined ulcer exists, exposing the muscular fibers. The diphtheritic deposit may occur in isolated patches, or extend continuously from the nares to the bronchi.

The lungs are frequently congested, and become the seat of lobular hepatization in various stages, often sufficiently extensive to be the cause of death, even where no exudation has occurred in the air-passages. The most frequent pulmonary lesion is broncho-pneumonia. Where the air-passages are the seat of the exudation, lobar and lobular pneumonia, the latter often secondary to embolism of the smaller bronchi, with collapse of lung-tissue, and acute vesicular emphysema, have generally been induced.

The heart is dilated but not hypertrophied; its weight is little if at all increased. Fibrinous coagula are very frequently met with in the cavities of the heart and the large vessels. Endocarditis has been found to affect the mitral valve more often than the tricuspid or pulmonary valves.

Lesions in the brain have been rarely found. If death has occurred from asphyxia, the meninges present a venous engorgement, with minute extravasations of blood.

The lymphatic glands are often swollen and inflamed. The submaxillary and parotid are especially engorged, and the cellular tissue around the glands is infiltrated. The spleen is frequently increased in size and is soft, often presenting a cloudy or opaque appearance on section.

The stomach often presents serious changes ; the intestine frequently shows traces of catarrhal enteritis, with tumefaction of its follicles and glands.

The kidneys, in the early stage of the disease, are simply congested. When there is nephritis the desquamative form is most often observed, and is sometimes extensive and dangerous.

Prognosis.—The prognosis should be very guarded, even in apparently favorable cases, until two or three weeks have elapsed since recovery. The disease, however mild at its commencement, may terminate fatally by a sudden attack of cardiac or respiratory failure, even when the case appears to be proceeding favorably. Diphtheria is especially serious in young children ; it is almost always fatal before the third year of life. Dangerous indications are the rapid extension of the false membrane to the nasal fossæ, the larynx, and the bronchi, by reason of mechanical obstruction ; also hemorrhage from the nose or throat, bronchi or intestines ; pseudo-membranous coryza ; intense albuminuria ; purpuric spots ; great swelling of the cervical glands ; marked diminution of temperature ; vomiting or diarrhœa at an advanced period of the disease. The character of the epidemic, bad hygienic conditions, overcrowding, want of cleanliness or of nourishment are controlling circumstances.

The course of the disease is variable, terminating usually in from two or three days to a month. In exceptional cases the disease may persist for two or three months. Recurrences of diphtheria have been frequently noted. Relapses may be occasioned by the eruptive fevers.

Prophylaxis.—Immediate isolation of a case, or a suspected case, is of the utmost importance. When practicable unaffected children should be sent away, to prevent their possible infection. All the furniture and utensils used in the sick room, as well as the entire room, should be subjected to the formaldehyde process of disinfection. Comparatively, sulphur fumigation is valueless. The bedding and clothing of the patient used during the illness should be destroyed or boiled in a strong solution of bichloride of mercury. The breath of the patient should not be inhaled, nor should a particle of the membranous exudate be permitted to come in contact with a mucous or abraded cutaneous surface. The physician and nurse are liable to infection, and may be the means of communicating the disease to others by the ejection of the poisonous material on their clothing by the coughing and strangling of the patient during the examination or treatment of the throat and nose.

Hygienic.—In every case of membranous sore throat it is expedient to swab the fauces with a sterilized cotton-wrapped stick, and to have the exudate taken from the throat submitted to bacteriological examination. The patient should be placed in a medium-sized, well-lighted room, that can be shut off from the rest of the house. Ventilation should be obtained by opening the window, top and bottom, keeping the temperature at from 68° to 72° Fahr., carefully avoiding drafts. The carpet and all unnecessary furniture should be removed from the room, and only such persons as are required to take care of the patient should be allowed in the sick chamber. All discharges from the patient's mouth or nose should be received upon cloths, which should be immediately burned. The excreta from the bowels and bladder should be properly disinfected with a strong solution of bichloride of mercury or carbolic acid. The sick-room may be disinfected while the patient is there without causing harm, and lessening the liability of the spread of the disease. Of oil of eucalyptus and carbolic acid take each one ounce, and turpentine eight ounces. Of this mixture two tablespoonfuls are added to one quart of water contained in a wide pan, which may be placed under the bed.

In many instances persons who have had diphtheria continue to carry the germs of the disease in their throats for many days after the disappearance of the local symptoms. With regard to schools, the children of a family or those living in the same house in which there is a case of diphtheria should not be admitted to a school until all danger of cantagion is over.

Dietetic.—It is highly important that the patient should be well nourished. Nourishing aliments are required from the beginning. Milk may be given freely and in any form, iced, scalded (not boiled), plain or with oxygenated water; if milk should disagree with the patient, a little salt or lime-water may be added. A glass of milk with an egg beaten in it may be given occasionally. Ice-cream and water ices are allowable, but the stomach should not be chilled. Buttermilk and Koumyss are acceptable. An adequate amount of water to slake the thirst may be given. For generations alcohol, in some form, has been relied upon from the very onset of the disease, not only for its stimulating effect, but with the idea that it antidoted the poison of diphtheria. The indiscriminate use of alcoholic stimulants should be most strenuously inveighed against. Alcohol will not overcome the toxæmia of diphtheria, but it may be of inestimable value when the pulse is feeble and irregular—in cases of threatened heart failure. Beef-juice, soups, and broths are very nourishing. Patients who can not swallow food must be nourished by enemata.

Local Treatment.—The most dangerous form of the disease is that which attacks the nares and the nasopharynx, especially when the false membrane is soft and easily macerated; in these cases the virus is most readily absorbed. The nares should be gently douched every three hours with a weak warm salt solution (one drachm to a pint of water), and followed by the peroxide of hydrogen, one part of the fifteen-volume strength to fifteen parts of water. Permanganate of potash is an excellent disinfectant; it may be used to cleanse the nares in the proportion of five grains to eight ounces of water. Gargling, in young children, is usually impossible. Local applications to the fauces will be allowed by adults and large children; young children will struggle and become exhausted, and it is questionable if the patient is not more injured than benefited by the attempt to make applications to the throat of a struggling child with a weak heart. When practicable, the peroxide of hydrogen, used either in its full strength or in fifty per cent. solution of the fifteen-volume strength, will be found an excellent detergent and disinfecting agent. It may be used in an atomizer, or carried directly to the affected part by a probe well covered with absorbent cotton. The following solution may be carefully applied to the pseudo-membrane, acting both as a solvent and disinfectant: Lactic acid, three drachms; lime water, eight ounces. Dr. Teets recommends most highly Turpentine one drachm, Alcohol one ounce. Of this mixture put one teaspoonful in half a glass of water, with which atomize or swab the throat every hour or two. The permanganate of potash solution is also useful in the throat. Applications to the nose or throat should be made with the patient in a recumbent or semi-recumbent posture.

The external application of cold, by means of the ice-bag or Leiter's coil, will reduce the inflammation and favor the rapid necrosis and separation of the exudate. Occasionally the patient may be allowed to take into the mouth bits of cracked ice, which will relieve the thirst and reduce the congestion. In some cases it will be advisable to employ hot in lieu of cold applications, if the latter proves to be intolerable. Heat is equally efficacious when the application is continuous and as hot as can be endured. Steam inhalations exert a most beneficial influence on the local process by facilitating suppuration and hastening the exfoliation of the diphtheritic deposits. The inhalation of the vapor arising from the slaking of lime is highly recommended as a means to dissolve the false membrane. Some pieces of freshly-burned lime are put into water, and the vapor is directed to the throat. Cleanliness of the parts, frequent removal of decomposing material, and disinfection of the discharges are of great importance for the prevention of septicæmia.

ANTITOXINE. — Remarkable results are claimed for the "Serum Treatment" of diphtheria. While vast statistics have been compiled to record its brilliant results, a great deal has been said and written by those who object to its employment until it has passed the most crucial tests of the tentative stage from which it has not yet emerged.

The antitoxic serum is used by subcutaneous injection preferably in the interscapular region, because the child, lying face downward, does not see the needle and can be easily held by assistants. The part is thoroughly cleansed by means of sublimated cotton or gauze saturated in alcohol, and, after injection, is hermetically sealed with flexible collodion. The syringe should be thoroughly aseptic, as the serum is an ideal culture medium for many germs. Subsequent injections may be made in the same region as the first, or in the loins or thigh. The amount of antitoxine used is dependent upon the time of making the injection, the age and weight of the patient, and the gravity of the disease. For severe cases in children under two years old, and for mild cases in those over that age, the initial dose should be 1,000 units, to be repeated in from eighteen to twenty-four hours if there is no improvement; a second dose is not usually required. In children over two years old the dose should be, in all laryngeal cases with stenosis, from 1,500 to 2,000 units for the first injection, to be repeated as above mentioned if there is no change in the membrane, pulse, temperature, or dyspnœa. The dose should always be estimated in antitoxine units, and not in the amount of serum. The greater the number of antitoxine units in a given quantity of serum the more desirable that particular manufacture is. Antitoxine should be administered as early as possible on a clinical diagnosis, not waiting for a bacteriological culture.

In the opinion of those who have had large experience in its use, diphtheria antitoxic serum is believed to exert a curative effect in all cases of the disease, pure and simple, where no other infection exists. If used before the diphtheria toxines have so invaded the tissues as to destroy them, the antitoxine is a specific; but where the symptoms are such that life could not exist (profound toxæmia or septicæmia), this method of treatment, nor probably any other method, is incapable of effecting a cure.

It is maintained that the specific curative effect of antitoxine will be the more certainly excited the earlier the treatment is begun. According to statistics it is apparent that by far the best results are obtained when treatment is commenced within the first forty-eight hours, and not later than the third day; that after the third day the mortality increases rapidly, and that after the fifth day comparatively little benefit is derived from the use of antitoxine.

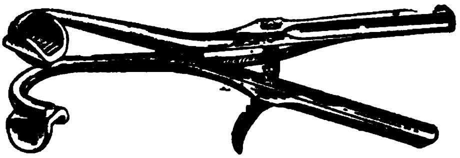
Certain effects have been observed clinically to follow the administration of antitoxine in cases brought under treatment at an early date: A diminution of the faucial swelling; a lessening of the irritating and offensive nasal discharge; a limitation of the extension and an earlier separation of the exudation; and an improvement in the general condition and aspect of the patient.

As the changes in laryngeal diphtheria are rapid, and children who appear to be doing well may suddenly present symptoms of extreme urgency, it is necessary to watch closely for signs of obstruction to respiration, and to act promptly to relieve the obstructive dyspnœa. The two measures which have been recommended are intubation and tracheotomy. Intubation should not be performed when there is a strong probability that the trachea is crowded with false membrane. The results achieved by intubation, as recommended by the late Dr. Joseph O'Dwyer, justifies a faithful trial before resorting to the operation of tracheotomy. His directions are as follows:

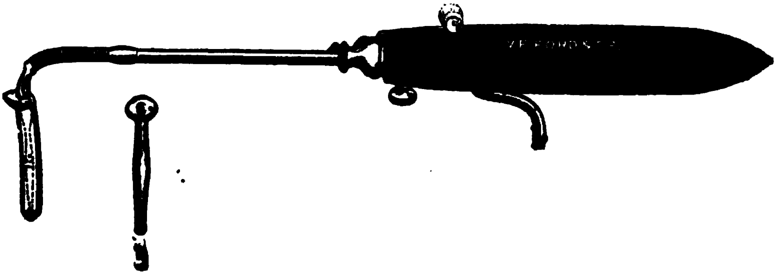
INTUBATION.—Each tube is supplied with a separate obturator, which serves as a means of attachment to the introducer. The numbers on the scale indicate the years for which the corresponding tubes are suitable. The smallest tube when applied to the scale will reach the line marked 1, and is suitable for children of one year and under. The second size is suitable for children between one and two years old. The third size is for children between two and four years old, and the next size for those from four to seven years old, and so on. The largest size may be used with safety in the adult, by having a string attached.

The female larynx, in children as in adults, is smaller than the male; this should be considered when selecting the tube, as well as the size of the child compared with its age.

When the proper tube has been selected a fine thread of braided silk, about twelve inches in length, is passed through the small hole near its anterior angle, the ends being tied to prevent its accidental removal. The obturator is then screwed tightly to the introducer and passed into the tube. The child is held upright in the arms of the nurse, with its head on her left shoulder. The patient's arms should be secured to the sides or behind the back either by being held below the elbows by the nurse or by wrapping a sheet around the body. The legs should be secured between the nurse's knees. The gag is inserted in the left angle of the mouth, well back between the teeth, and opened as widely as possible without using undue force. An assistant, standing behind the patient, holds the head, thrown somewhat backward, while the operator inserts the index finger of the left hand to elevate the epiglottis and direct the tube into the larynx. The instruments should be worked in the median line, the operator facing the patient squarely. The handle of the introducer is held close to the patient's chest in the beginning of the operation, and rapidly elevated as the tube approaches the glottis. Very little force is necessary to overcome the obstruction, and if the tube does not enter the larynx easily it should be withdrawn and another attempt made. It should be pushed well down into the larynx before it is detached from the obturator; while removing the obturator it is necessary to keep the finger in contact with the head of the tube to prevent it, also, being withdrawn. The string should not be removed until the dyspnœa is relieved and the operator is certain that the tube is in the larynx. When the thread is withdrawn the finger must be kept in contact with the tube to prevent its being also withdrawn. The removal of the tube is accomplished by guiding the extractor into the tube along the left index-finger, which is brought in contact with its head and then pressed toward the patient's right, in order to uncover the aperture and allow the extractor to enter in a straight line. Continuous pressure with the thumb is made on the lever above the handle while the tube is being withdrawn.



Gag.

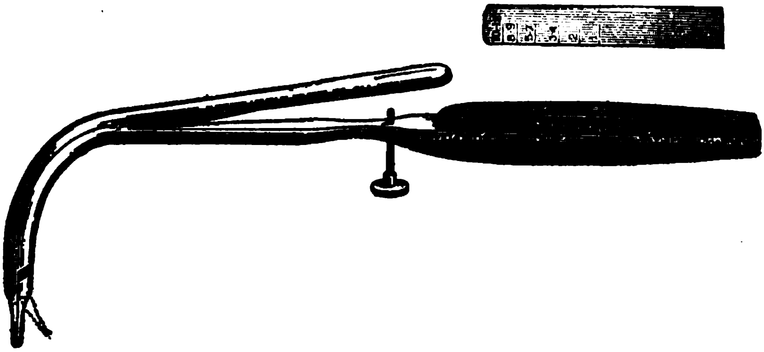


Introducer.

The proper time for removing the tube from the larynx will depend upon the age of the patient, the character of the disease —whether of slow or rapid development—and the progress of the case. The younger the patient, as a rule, the longer the tube will be required. When the disease has developed slowly, and has therefore run a greater part of its course before calling for operative interference, the tube can be dispensed with earlier, sometimes after the second or third day.

To avoid the tendency of food finding its way into the larynx of young children who have been intubated, it is suggested that the child be so placed that its head is lower than its feet, fluid food being administered by means of an ordinary feeding-bottle to which a rubber nipple is attached. To alleviate thirst, give ice or ice-cream. Stimulants should, under these circumstances, be administered only by enemata.

The cases of diphtheria which are favorable for intubation are those where the obstruction comes on rapidly, and where the dyspnœa is due to œdema of the mucous membrane of the larynx, or to spasm, rather than to the extensive formation of false membrane. Tracheotomy may be necessary where there is much swelling of the tonsils and fauces, and is recommended in those cases which are unamenable to intra-laryngeal interference.



Extractor and Scale.

Tracheotomy may be performed above or below the thyroid isthmus; the latter is to be preferred, as it allows more room for the canula. If an anæsthetic is not given, the patient should be firmly held, the shoulders elevated and the head extended. The operator should stand at the patient's right side, and after carefully examining the region and determining the precise point of opening the trachea, should make a straight incision *exactly* in the median line, extending from the cricoid cartilage to nearly the level of the inter-clavicular notch. After separating the sterno-thyroid muscles in the median line the dissection should be cautiously continued down to the trachea. The separated tissues should be held aside by retractors and every bleeding vessel secured before the trachea is exposed and opened. The inferior thyroid vein, and occasionally the anterior jugular vein, are encountered in the median line; these vessels should be secured with a double ligature before being divided. The opening should be made by thrusting the knife, the edge directed upwards, into the tube, and dividing it to a sufficient extent. A canula should be selected which is so curved as not to press upon the walls of the trachea, which can be worn with comfort, and which will be least liable to obstruction.

Medication.—**Apis mellifica.**—Great debility from the beginning; false membrane assumes at once a dirty-grayish color, and is thick, like wash-leather. Tonsil is studded with deep, gray, angry-looking ulcers. Pharynx is red, dry, and shiny, as if varnished. The uvula, in fact the whole throat, is œdematous; stinging pains in the throat, extending to the ears when swallowing; puffiness of face and neck. There is not much fever, sometimes there is a suspicious absence of heat. Breathing is difficult from swelling of throat and tongue. There is not much thirst; urine is scanty, highly-colored, and burning. This remedy is thought to be beneficial as a prophylactic, in the third dilution, four doses daily.

Arsenicum album is indicated when there is adynamic fever, the patient is restless and prostrated, with weak and rapid pulse. Constant desire for cold drink, but takes only a little at a time, or is better by drinking hot water; all symptoms worse about midnight. The throat is swollen externally and internally, and the diphtheritic membrane has a dark, dry, and wrinkled appearance. The discharge from the nose is thin and excoriating. The urine is scanty; the bowels are constipated, or else there is an offensive watery diarrhœa. When, in addition to the usual Arsenicum symptoms, there is marked enlargement of the lymphatic glands, it is well to substitute **Arsenicum iodatum.**

Baptisia is one of the best remedies in the typhoid type of the disease. The fever increases in the afternoon, with slight drowsiness, thick speech, and bewilderment of the mind. The false membrane is dark, and exhibits a gangrenous tendency; the discharges from the mouth are horribly offensive. The patient can swallow only liquids; solid food is rejected. The face has a heavy, besotted look, the eyes are stupid and heavy.

Crotalus.—Hemorrhage from nose and all orifices of the body. Excessive prostration. Blood seems to be disorganized, and stains all the tissues—is passed in the urine, etc. Yellow color of the whole body. Tongue swollen to twice its natural size; throat dry and swollen; tissues infiltrated; glands swollen, associated with great thirst and difficulty in swallowing.

Kali bichromicum.—The discharges, whether coming from the nose or throat, or both, are decidedly stringy; the false membrane is quite thick and brownish-yellow, like wash-leather. Deep-eating ulcers in the fauces, with indurated edges, and a disk of stringy, glairy, tenacious mucus. Sticking pains in tonsil, extending to the ear on swallowing, and also down the neck. Swelling of submaxillary and parotid glands. Rough, hoarse voice, barking cough; mucus is tough as pitch, threatens to suffocate on account of being so stringy.

Kali permanganicum is indicated when the throat inside and outside is swollen, the odor of the breath is so offensive as to be almost unendurable, there is a thin discharge from the nose, and the general prostration is most profound.

Lachesis.—The affected parts are purple, livid in color; there is little swelling, but the intense pain is out of all proportion to the amount of inflammation. The nasal discharge is thin, sanious, and excoriating. Diphtheria in its worst form; difficulty in swallowing liquids—they regurgitate through the nose. The false membrane is more on the left tonsil, or begins on the left side and extends to the right; excessive sensitiveness, can bear nothing about the throat; patient arouses from sleep smothering, and has a croupy cough. The glands of the neck are swollen, and the cellular tissue is infiltrated. Great weakness and general prostration.

Mercurius cyanatus is especially useful in the adynamic or malignant form of the disease. There is extreme prostration, with cold, clammy skin and quick, weak pulse. The breath is fetid, the tongue is coated brown, or, in severe cases, even black. The expectoration is thick and ropy, and there is harsh, barking, croupy cough, with dyspnœa. At first the diphtheritic membrane is thin, like skim-milk, covering the velum palati and tonsils; as soon as the glands begin to swell, the membrane becomes dark, threatening even to grow gangrenous.

Mercurius iodatus ruber is of use when the left side of the throat is affected, and there is a yellowish-gray membrane forming there. The glands of the neck are swollen, and the cellular tissue is involved. There is an accumulation of slimy or sticky mucus in the mouth or throat, the attempts to swallow which causes more pain than does the swallowing of food.

Mercurius iodatus flavus.—Diphtheritic deposit begins on the right side, with swelling of the glands and accumulation of thick tenacious mucus in the throat. There is a thick, dirty yellow coating on the base of the tongue, the tip and sides being red.

Phytolacca decandra is useful in diphtheria when there is high fever, with aching in head, back and limbs. The fauces are dry and rough, and dark red in color. There is pain on swallowing, especially at root of tongue, with aggravation from hot drinks. Great exhaustion, prostration, and aching all over the body.

Consult **Ailanthus, Ammonium carbonicum, Ammonium causticum, Carbolic acid, Kreosotum, Nitric acid, Rhus toxicodendron, Arum triphyllum, Bromium.**

The remedies which have been found most useful in the treatment of diphtheritic paralysis are the following: **Argentum nitricum, Causticum, Cocculus, Conium, Gelsemium.**

The use of galvanism and faradism may be taken advantage of, if employed with caution. Massage has also proven useful.

THE LARYNX.

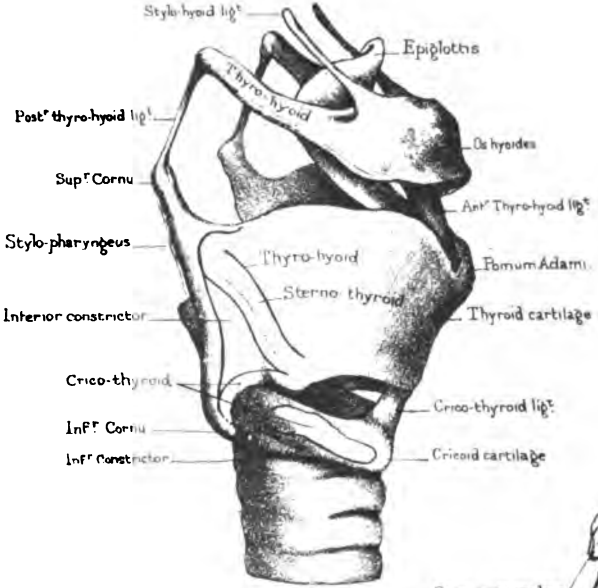
ANATOMY.

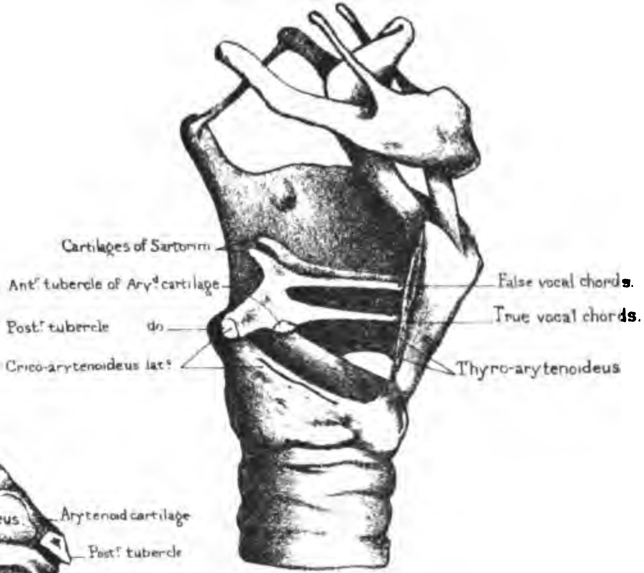
The Larynx is the portion of the air-passage specially modified for the production of the voice. It lies between the large vessels of the neck, below the hyoid bone and the tongue, and inferiorly it is directly continuous with the trachea. It consists of a framework of cartilages which are connected together by ligaments and moved by various muscles.

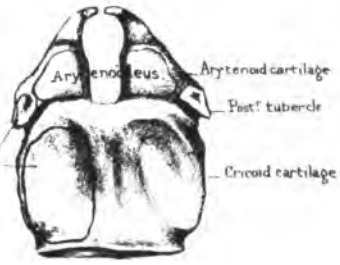
The chief cartilages of the larynx consist of the thyroid, the cricoid, the two arytenoid, and the epiglottis. There are also four small and much less important cartilages, the two cornicula laryngis (cartilages of Santorini), and the two cuneiform (cartilages of Wrisberg). The thyroid, the cricoid, and the two arytenoid are composed of hyaline cartilage, and are prone to calcareous degeneration in old age. The epiglottis is not infrequently thickened by disease or injured by ulceration. The remaining four are made up of yellow elastic fibro-cartilage, and have little tendency to ossify.

The thyroid cartilage, the largest cartilage of the larynx, consists of two lateral symmetrical plates, united in front at the isthmus, forming an angular projection most prominent at its upper part, quite marked in the male, being called the *pomum Adami*. The two symmetrical halves, named the *alæ*, are somewhat quadrilateral in form, and each have a rounded posterior border into which the stylo-pharyngeus and palato-pharyngeus muscles are inserted, and which is prolonged into a superior and an inferior cornu. Of each half the anterior border is the shortest, the *pomum Adami* being surmounted by a deep thyroid notch, which permits the cartilage to rise with greater facility behind the os hyoides in deglutition. The upper border gives attachment throughout its whole extent to the thyro-

LARYNX.







Postr surface of Cricoid and Arytenoid cartilages

hyoid membrane. The inferior cornu articulate with the cricoid cartilarge (on which it moves), and give attachment to the crico-thyroid muscle. The internal surfaces of the alæ are smooth, slightly concave, and lined by mucous membrane; in front, in the receding angle formed by their junction, are attached the thyro-epigottidean ligament, the two pairs of thyro-arytenoid ligaments (true and false vocal chords), and the two thyro-arytenoid muscles. The indistinct oblique ridge which passes downwards and forwards from the superior tubercle at the posterior part of the superior border ends at the lower border in an inferior tubercle. This ridge gives attachment below to the sterno-thyroid and above to the thyro-hyoid muscle, whilst the small smooth surface behind it gives origin to part of the inferior constrictor muscle.

The cricoid cartilage, which is shaped like a signet ring, is thicker and stronger than the thyroid. It is deep behind, measuring about an inch from above downwards; in front it forms a narrow ring or arch, the space between this cartilage and the thyroid being filled in by the crico-thyroid membrane. This space is practically interesting, because it is here that the operation of laryngotomy is performed. The superior border, markedly elevated behind, descends with a deep concavity in front below the thyroid cartilage. The inferior border is horizontal, and is connected by an elastic membrane to the first ring of the trachea. The upper border of the deep portion presents two oval articular surfaces for the arytenoid cartilages, external to which are the origins of the crico-arytenoidei laterales, the crico-thyroid in the middle, and lower down a portion of the inferior constrictor. In the middle line posteriorly is a slight vertical ridge, to which some of the longitudinal fibres of the œsophagus are attached; on each side of this ridge is a broad depression occupied by the posterior crico-arytenoid muscles.

The arytenoid cartilages, two in number, are symmetrical in form and position. They may be compared in shape to irregular three-sided pyramids, and they rest by their bases on the posterior and highest part of the cricoid cartilage; the anterior angle gives attachment to the true vocal bands, and the external angle gives insertion to the lateral and posterior crico-arytenoid muscles. The posterior surface of the cartilage is concave and gives attachment to the arytenoideus muscle, which crosses from one cartilage to the other and fills up the gap between them; the anterior surface gives attachment to the false vocal band and the thyro-arytenoid muscle; the internal surface is flat and covered with mucous membrane, and contributes to form part of the margin of the glottis. The apex of each cartilage is curved slightly backwards and inwards, and is surmounted by the *corniculum laryngis* (cartilage of Santorini). To it is attached the aryteno-epiglottidean fold.

The *cuneiform cartilages* (cartilages of Wrisberg) are two very small soft yellowish cartilaginous bodies, placed, one on each side, in the fold of the mucous membrane which extends from the summit of the arytenoid cartilages to the epiglottis.

The epiglottis is a structure composed of yellow fibro-cartilage, situated at the base of the tongue in front of the superior opening of the larynx, which it closes during deglutition. In shape it somewhat resembles the leaf of an artichoke. It is attached to the angle of the thyroid cartilage and to the posterior surface of the body of the hyoid bone. During respiration its ordinary position is perpendicular, or nearly so; but when the larynx is raised and the tongue is depressed during the act of deglutition the epiglottis drops backwards and downwards, thus closing the opening of the larynx. The depression on each side between the tongue and the epiglottis is termed the *vallecula*. The ligaments of the epiglottis are the hyo-epiglottic, the thyro-epiglottic, and the three glosso-epiglottic folds of mucous membrane.

The vocal bands or thyro-arytenoid ligaments are composed of elastic fibrous tissue, four in number, two on each side, extending horizontally backwards from the angle of the thyroid to the anterior part of the arytenoid cartilage. The superior ligaments (sometimes called the *ventricular bands* or *false vocal chords*, because they have little or nothing to do with the voice) are attached in front to the receding angle of the thyroid cartilage, and behind to about the middle of the anterior surface of the arytenoid cartilage. The inferior ligaments are termed the *true* vocal bands (or chords), because, by their vibration, they produce the voice. Their average length is about five-eighths of an inch.

They are attached in front close together to the angle of the thyroid cartilage, and behind to the anterior tubercle of the base of the arytenoid cartilage. The interval between the true vocal bands is the *rima glottidis.*

Between the true and the false vocal bands there is a little pouch or recess on each side called the *ventricles of Morgagni.* The anterior part of the ventricle leads up by a narrow opening into the *laryngeal pouch* or *sacculus laryngis,* which projects upward between the upper chord and the thyroid cartilage. The mucous membrane is continued from the ventricle into this sac, in which it is provided with numerous mucous glands.

The muscles which act specially upon the rima glottidis are nine in number, four on each side and one in the middle. Each crico-thyroid muscle arises from the side of the cricoid cartilage, and is inserted into the lower border and lesser cornu of the thyroid cartilage. Its action is to stretch the vocal bands, which it does by depressing the thyroid cartilage, the arytenoid cartilage remaining fixed.

Each crico-arytenoideus posticus arises from the posterior surface of the cricoid cartilage, and is inserted into the posterior tubercle of the arytenoid cartilage. This is a muscle of inspiration. Its action is to separate or abduct the vocal bands by drawing the *posterior* tubercle of the arytenoid *towards* the mesial line, and therefore the *anterior* tubercle *from* the mesial line.

Each crico-arytenoideus lateralis arises from the upper border of the side of the cricoid cartilage, and is inserted into the prominent outer angle of the base of the arytenoid cartilage. Its action is to assist in closing the glottis, being antagonistic to the crico-arytenoideus posticus.

The arytenoideus is an example of a single muscle in the median line, its fibres crossing one another, and being divisible into superficial and deep layers. The superficial fibres cross obliquely from the apex of one cartilage to the base of the other, and *vice versa,* so as to form an X, whilst the deeper fibres pass transversely beneath them. Its action is to draw the arytenoid cartilages together, and thus narrows the glottis.

Each thyro-arytenoideus arises from the angle of the thyroid cartilage, and is inserted into the anterior surface of the base of the arytenoid cartilage. The thyro-arytenoidei being parallel to and attached to the same points as the vocal chords must necessarily, by their contraction, approximate the points of attachment, and so relax the chords and assist in narrowing the glottis. Their special action appears to be that of bringing the lips of the glottis parallel to each other—that of placing them in the "vocalizing" position.

The thyro-epiglottic and the ary-epiglottic muscles may be traced into the epiglottis from both the thyroid and the arytenoid cartilages. The upper muscle is contained in the ary-epiglottic fold of mucous membrane; the lower one spreads over the mucous pouch of the larynx. These muscles have been termed the *compressor vestibuli laryngis*. They depress the epiglottis, and assist in compressing the sacculus laryngis.

Tabular arrangement of the action of the intrinsic muscles of the larynx:

Crico-arytenoidei postici	open the glottis	govern the shape of the glottis.
Crico-arytenoidei laterales Arytenoideus	close the glottis	
Crico-thyroidei	stretch the vocal chords	govern the pitch of the voice.
Thyro-arytenoidei	relax the vocal chords	

The arteries of the larynx are derived from the superior and inferior thyroid arteries, the former being a branch of the external carotid and the latter of the thyroid axis from the subclavian.

The nerves of the larynx are the superior laryngeal and the inferior or recurrent laryngeal, branches of the pneumogastric nerve, joined by branches from the sympathetic. The mucous membrane of the larynx, back of the tongue, and the crico-thyroid muscles, are supplied by the superior laryngeal; the remaining muscles are supplied by the inferior laryngeal, the arytenoideus receiving filaments from both nerves.

ANÆMIA AND HYPERÆMIA OF THE LARYNX.

The normal red color of the mucous surface of the larynx may be either diminished or increased. Pallor of the laryngeal mucous membrane may be associated with general anæmia from any cause, in Bright's disease or diabetes, or in chlorosis. It does not require special notice except when it occurs as a premonitory symptom of laryngeal phthisis, under which title anæmia of the larynx will be considered.

Hyperæmia of the larynx is a congestion of the mucous membrane of the larynx, being usually due to catarrhal influence, and generally precedes or follows inflammation. It may be active or passive, acute or chronic. The parts most decidedly affected are the ary-epiglottic folds, ventricular bands, and the ventricles, the epiglottis, vocal bands, and inferior cavity of the larynx undergoing little change. The color of the mucous membrane varies according to the causes which produce the hyperæmia. The irregular use of the voice—loud declamation and singing—and faulty methods of breathing and voice-production, anything which induces fatigue or irritation of the vocal apparatus, may cause laryngeal hyperæmia. There is more or less laryngeal hyperæmia associated with the change of voice at puberty. It may be induced by the habitual use of alcohol, and, in some persons, tobacco, particularly cigarette smoking. It is observed in those who are exposed continuously to irritating gases or chemical fumes, or confinement in an impure, overheated, or dusty atmosphere. In these cases the individual is very apt to contract acute or chronic laryngitis. In active congestion small ecchymotic spots may sometimes be seen which represent capillary hemorrhages.

Venous congestion may result from chronic valvular diseases of the heart, emphysema, or any obstruction to the venous circulation. In passive hyperæmia the dusky or bluish tinge takes the place of the bright or pinkish red.

Symptoms.—A slight degree of hyperæmia may be present without exciting attention. When the vocal bands are involved the voice becomes veiled, is easily fatigued, and hoarseness supervenes. The larynx feels dry, and at times painful sensations are experienced. Sometimes there is a short, hacking cough, or a clearing of the throat, due to a desire to remove the sensation of a foreign body.

Treatment should be directed to the removal of the primary cause, attention to diet and hygiene, and the administration of the indicated remedy.

ACUTE LARYNGITIS.

(SYNONYMS: *Acute Catarrh of the Larynx; Laryngitis Catarrhalis Acuta.*)

Acute catarrhal laryngitis is more frequent in males than females, and in adults than children, but in childhood the symptoms are intensified and attract more attention. It may be mild or severe in type.

There is a peculiar predisposition in certain persons to catarrhal affections—*e. g.*, those who perspire easily, who are weakly, cachectic, and who keep themselves too warmly clad or too much housed up. Those who are constantly exposed to changes of temperature are much less liable to be affected. Among the exciting causes are chilling of the surface of the body (due to undue exposure, or of ordinary exposure when the system is depressed) particularly of the neck and feet; inspiration through the mouth of moist cold air, dusty air, and acrid vapors; the excessive use of tobacco or alcohol; straining the parts in coughing, screaming, or singing; it may also arise from the impaction of a foreign body in the larynx. It is a frequent accompaniment of the exanthemata, especially measles.

Pathology.—In mild cases the inflammatory process may be limited to certain portions of the larynx, presenting the appearances of simple catarrhal inflammation, or the congestion and swelling may be diffused over the entire mucous membrane; the swelling is due to infiltration and increased size of the mucous follicles. In some cases it is accompanied by ecchymosis of the mucous membrane, and blood escapes in the secretions. Where the inflammatory process is superficial all the products are upon the surface of the mucous membrane, and there is little danger. There is partial destruction of the normal epithelial structure, but the process seldom leads to ulceration. In more severe cases the submucous tissue of the larynx is œdematous, the epiglottis is thickened, the ary-epiglottidean folds and the ventricular bands are greatly swollen, which makes this form of the disease very dangerous. This submucous infiltration causes spasm of the glottis, partly by reflex action, and in part by direct irritation of the adductors of the vocal bands. When the vocal bands (which normally are white, with a bright tendinous lustre) become inflamed, they vary in color from light rose to dark red, which may be diffused uniformly or irregularly over their surface. Both chords are generally affected at the same time. Inflammation of moderate intensity is marked simply by vascular injection; in the more severe forms swelling is also observed. The margins of the chords are then more rounded, less sharply defined than normally, and their mobility is impaired.

Symptoms.—The approach of the disease may be insidious, a slight laryngeal catarrh suddenly becoming very severe in character; or its onset may be sudden and violent. At first there is usually dryness and soreness of the throat, accompanied with a sense of constriction or a tickling irritation, with a disposition to cough or to constantly clear the throat. The voice is always more or less altered, is shrill, hoarse, and uncertain, becoming rapidly aphonic. If there be a coexisting inflammation of the fauces, there will be some difficulty in swallowing. As the disease progresses the breathing will be embarrassed. The character of the respiration is dependent upon the portion of the larynx involved. If the upper portion be exclusively affected, the dyspnœa will be entirely inspiratory; if the whole larynx is œdematous, both inspiration and expiration will be difficult. The cough at first is spasmodic and dry; later it is moist, the expectoration consisting of frothy, tenacious mucus, which occasionally may be blood-streaked. The sputa soon becomes thick and muco-purulent, the pus elements predominating. In severe cases, as the disease advances, the patient's distress increases; the temperature may rise to 105° Fahr., and the pulse is frequent and hard in character. Respiration is seriously impeded, for the swollen membrane nearly closes the narrow aperture through which the air enters the lungs; the face becomes livid and anxious, the lips bluish, the pulse irregular, and the eyes protrude as in strangulation. In children the small size of the rima glottidis and the extraordinary liability to spasmodic laryngeal affections combine to make this disease one of great importance. The symptoms detailed above are more pronounced, and the suffering is much more intense.

A laryngoscopic examination will reveal the entire mucous membrane to be of a bright red color, or the hyperæmia may be confined to the ventricular bands, the inter-arytenoid fold, or the posterior extremities of the vocal bands. In severe cases the mucous membrane is red and turgid; when the ventricular bands are affected they may become swollen to such a degree as to entirely conceal from view the vocal bands. When œdema has taken place the parts lose much of their intense redness by reason of the stretching due to the swelling. The epiglottis is not only intensely red but considerably swollen.

Diagnosis.—The history of the case and a laryngoscopic examination will readily establish the diagnosis. In young children it is often difficult to distinguish between catarrhal and croupous laryngitis. Laryngismus stridulus is characterized by its sudden accession, generally during sleep, and by absence of constitutional fever.

Prognosis.—In young children this disease is always attended with danger; in adults the danger depends on the amount of œdema present. Acute laryngitis is never fatal except when there is extensive infiltration of the submucous connective tissue. If treatment be adopted early the attack subsides in the course of about a week. The disease may continue indefinitely by repeated relapses, and finally assume the chronic form.

Treatment.—It is evident that prophylaxis consists in the avoidance of whatever plays a part in the etiology of the disease. Coexisting disease of the nasal cavities, nasopharynx, or throat must receive the necessary treatment for the reduction of congestion and obstruction. The body should be uniformly and properly clothed, and the feet should at all times be kept dry and warm. Taking cold is a disturbance of the heat-producing force of the body, which is largely dependent upon the healthy functional activity of the skin. To maintain this functional activity the daily use of the cold shower-bath, or the cold sponge, is advised. The use of tobacco and alcohol should be prohibited. Absolute rest of the voice should be enjoined, particularly upon professional voice-users. Mild cases of acute laryngitis should receive no local treatment. In severe cases, if œdema make its appearance, the danger of strangulation may be averted by deep scarification of the tissues involved, or the performance of tracheotomy. With public speakers and singers considerable anxiety will be manifested concerning the continuance of the disease and their ability to speak or sing at a given time. In the early stage of the attack the patient should be given a hot mustard foot-bath and put to bed. The patient's room should be kept at an even temperature, ranging from 70° to 75° Fahr., free from drafts and charged with steam. Vapor inhalations should be commenced early and perseveringly continued; they give the greatest amount of relief and have great power in arresting the inflammatory process. This purpose is best subserved by putting one teaspoonful of the compound tincture of benzoin into a pint of water—140° Fahr.—in a suitable apparatus so that the vapor may be diffused in the air of the room, but it must not be allowed to get cold before it reaches the patient. The application of continuous cold over the larynx, by means of an ice-bag or Leiter's coil, often controls the inflammatory process and diminishes the tendency to spasm more promptly than hot moist sponges.

Aconite is indicated in the early stage, after exposure to cold wind; also after straining the voice by singing or speaking.

Allium cepa.—Tickling, with aching and pain in the larynx as if it would be torn when coughing.

Arum triphyllum.—Voice is uncertain, uncontrollable, changing continually; pain and rawness in the larynx; dry cough, patient cringes under it, it hurts so.

Belladonna has a barking cough, waking suddenly about midnight; pain, dryness and soreness in larynx; headache; fever.

Dulcamara.—Rough, hoarse voice. Renewed attacks when weather changes suddenly from warm to cold.

Hepar sulphuris calcareum.—Hoarseness, roughness in the throat; larynx is sensitive to cold air; cough worse in the morning; wheezing, and painfulness of a small spot in the larynx. The expectoration is slight, and there is little fever.

Mercurius solubilis.—Hoarse rough voice; burning, rawness in the larynx; fluent coryza and sore throat; chilliness; easy perspiration without improvement.

Phosphorus.—Voice hoarse and rough; great sensitiveness of the larynx, it hurts to talk or cough; constant tickling, and dry cough, worse until midnight; tightness across the chest.

Rhus toxicodendron.—Hoarseness from overstraining the voice, with roughness and soreness in the larynx and chest.

Rumex crispus.—Constant desire to hawk, with burning, soreness, and raw sensation in the larynx when coughing. Hoarseness, worse evenings.

Sambucus nigra will be found useful when there are frequent spasms of the larynx occurring during the course of the disease.

Spongia is indicated after Aconite, when the larynx is extremely sensitive to touch; harsh, barking cough, and suffocative spells during sleep.

CHRONIC LARYNGITIS.

(SYNONYMS: *Chronic Laryngeal Catarrh; Laryngitis Chronica.*)

This disease is frequently the result of an uncured or neglected acute laryngitis; in many instances it is associated with, and is dependent upon, chronic inflammatory disease of the nose or nasopharynx. Dr. J. N. Mackenzie has stated that it may be laid down as a law that the vast majority of cases of pharyngeal and laryngeal diseases originate primarily in inflammation of the nasal cavities. The irritation occasioned by the post-nasal discharges trickling down the posterior pharyngeal wall, and the coughing and hawking which become necessary in the attempt to dislodge the secretion, is an important causal factor. Mouth-breathing acts not only through the irritation of the cold, dry, and impure air inspired through the mouth, as in nasal obstruction, or through the nasal passages, as in atrophy of the turbinated structures, but also by crippling the respiratory and vocal forces, shortening both inspiration and expiration, compelling rapid respiration, and resulting vocal and respiratory fatigue.

Chronic laryngitis is due to the same causes which induce the acute form; among these the excessive use of tobacco, careless or excessive use of the voice in speaking or singing, alcoholism and the disturbances incident thereto, are the most important and influential causes. Chronic laryngitis is often secondary to chronic bronchitis, especially in old age; it is also a frequent accompaniment of all long-continued diseases of the larynx, such as syphilis, phthisis, and laryngeal morbld growths. Rheumatism, particularly of the acute articular variety, may cause it. The inhalation of an excessive quantity of dust or other irritating particles must exert an injurious influence upon the mucous membrane of the larynx. The disease is very apt to occur in persons whose avocations lead them to strain or otherwise abuse the vocal organs. Boys at the age of puberty, when the larynx is undergoing rapid development, are susceptible to chronic laryngitis. While no age is exempt, the greater number of cases occur between eighteen and fifty years of age; it is more frequent in males than females.

Pathology.—In this disease there is congestion of the mucous membrane, dilatation of the blood-vessels, and altered secretion. The mucous membrane becomes hypertrophied, tougher, and more firmly connected with the subjacent tissue, particularly of the inter-arytenoid fold, and of the ventricular and vocal bands. The thickened and indurated condition of these parts is the principal cause of the vocal disability and hoarseness. Not only are the vocal bands injected, but their margins are roughened; when small, whitish elevations occur, it is designated "chorditis tuberosa." The epiglottis is swollen, and marked by enlarged and varicose veins. In glandular or granular chronic laryngitis, when the muciparous glands are principally affected, the surface is uneven and the tissues become more tense and compact. This condition is thought to be analagous to granular pharyngitis. Superficial erosion, especially of the epiglottis or of the vocal bands, is often seen in the course of the disease; ulceration is rare, unless the patient is cachectic or greatly debilitated.

The main symptom of chronic laryngitis is vocal disability, varying in degree from a slight modification in tone to complete loss of voice. Hoarseness occurs after the voice has been used a short while; but it is most marked when the larynx has been at rest for some time, the voice returning to its normal condition after the function has been exercised for a few moments; the voice soon becomes fatigued, and hoarseness or aphonia supervenes. Commonly there will be a sense of dryness and a constant feeling of contraction in the throat, with occasional cough or tickling, and a frequent desire and effort to clear the throat. The cough may be dry, harsh, and ringing, with little or no expectoration ; or the cough may be moist, when the mucus is sometimes excessive, but the sputum is brought up with difficulty—this latter type is usually associated with chronic bronchitis.

The laryngoscope will reveal the mucous membrane of the larynx to be more or less red and swollen, either diffused or localized ; this is most easily detected on the vocal bands and the arytenoids, but may involve the ventricular bands or the epiglottis. The redness usually fades off gradually into the healthy colored membrane. Sometimes the hyperæmia may be limited to one vocal band, or to a portion thereof, whilst the other is of a normal color. In old cases the vocal bands may present a dirty-red or muddy hue, and they have a thicker and more flabby appearance than in the normal larynx. The amount of secretion varies ; as a rule more or less discolored and tenacious mucus may be seen stretched between or lying upon the vocal bands. The elliptical opening observed between the vocal bands on attempting phonation is due to paresis of the internal tensors of the vocal bands. The follicles of the larynx are frequently enlarged and prominent, and in some cases the surface of the vocal bands becomes granular and often a very apparent unevenness of their edges. This is especially observable as the result of long-continued chronic catarrh of the larynx, and, as a consequence of histologic changes in the mucous membrane, *pachydermia laryngis* is produced. J. Solis Cohen defines the *Chorditis tuberosa* of Türck to be a chronic inflammation or *trachoma* of the vocal bands, apparently peculiar to singers, characterized by minute whitish tumors or nodules on their upper surfaces. They are also called *singer's nodules.* Superficial erosions may frequently be seen in the inter-arytenoid commissure and on the free margins of the vocal bands.

The main symptoms which these growths produce are huskiness of voice, the sensation of a foreign body in the larynx, and occasionally obstructed breathing.

The growth usually appears on the free border of a vocal band, at about the junction of the anterior third with the posterior two-thirds; it has also been observed in the inter-arytenoid space. On the vocal band opposite the growth there is often a corresponding depression, and on phonation the swelling sinks more or less into it.

Diagnosis.—A careful laryngoscopic examination is necessary to determine between inflammatory tumefaction, œdematous infiltration, or tuberculous exudation.

Prognosis.—While uncomplicated forms of chronic laryngitis rarely terminate fatally, the tendency of the disease is to remain stationary, and is subject to exacerbations and remissions. Recovery is possible, but slow, if proper treatment is persistently carried out for a sufficient length of time, and the exciting causes of the affection are carefully avoided; the voice, however, will remain more or less impaired. Erosions, especially of the epiglottis or of the vocal bands, are confined to the epithelial layer, and are generally of transitory duration. When perichrondritis occurs it is usually incidental to small-pox, typhoid fever, or syphilis. Papillomata may accompany, or be the result of, chronic laryngitis.

Treatment.—If the laryngitis depends upon faulty use of the voice, proper exercise of the voice by special training is frequently the only therapeutic measure necessary; if it be due to overuse, rest of the voice should be strictly enforced. Sudden changes of temperature and exposure to drafts must be avoided. Change from a variable to a more equable, and from a humid and cold to a warm and dry climate, will frequently exert a beneficial effect. Enlarged glands and varicose veins at the base of the tongue, follicular pharyngitis and hypertrophic rhinitis, or other forms of inflammation or obstruction must be radically removed before the laryngeal disease can be expected to be cured.

LOCAL.—The external application of wet compresses, hot or cold, will at times be especially efficacious. Tincture of iodine, and the ointment of the red iodide of mercury, applied over the thyroid cartilage, are serviceable as counter-irritants.

To maintain cleanliness of the parts is very important. The patient may use two or three times a day, for about five minutes each time, a detergent spray of sodium borate, or sodium bicarbonate, five grains to one ounce of quite warm water, in the ordinary handball atomizer. For office use Sass' spray tube is certainly the best instrument. To make the application of medicaments to the laryngeal cavity effectual, the spray should be driven directly in through a down-spray tube held over the laryngeal opening. When the horizontal tip is employed, the instrument should be held some distance from the mouth, so that, in the act of inspiration, the spray may be deflected into the larynx. If the tube is put within the mouth most of the spray will be condensed upon the pharyngeal wall, and but a very small quantity reaches the larynx. Tubes of hard rubber or of glass are to be preferred, because of the chemical action of certain remedies on metallic tubes. In making local applications the brush or cotton pledget may be used to touch the congested or ulcerated parts. The following astringent solutions are more serviceable than nitrate of silver, which is apt to cause spasm, even in weak solution: Aluminii chloridi, 10–30 grains to one ounce of water; zinci chloridi, 10–30 grains to one ounce of water; ferri perchloridi, 20–90 grains to one ounce of water. These applications must be made by the physician, aided by the laryngeal mirror.

To relieve congestion and stimulate the process of resolution the inhalation of medicated vapors is often useful. For vapor inhalations the following are recommended: Tincture benzoin compound, one drachm to pint of hot water (140° Fahr.); creosote, fifteen minims to pint of hot water; olei picis, twenty minims to pint of hot water.

Inasmuch as Chorditis tuberosa is the result of faulty methods of singing, especially of that part which has to do with the tone placing, the immediate treatment consists in absolute rest of the voice. Removal of singer's nodules by the application of strong caustics or the use of crushing forceps should not be considered except as a last resort. When expedient, the local application of Tincture **Thuja occidentalis** to the growth and the internal administration of the same remedy, in potency, will aid in its rapid departure.

Argentum metallicum.—Burning, soreness and rawness in the larynx, aggravated by talking or protracted use of the voice. Loss of voice after singing or talking; can not speak a loud word. Cough caused by constant irritation in larynx and from the accumulation of pure mucus, not purulent or not serous, but looking like boiled starch.

Argentum nitricum.—Chronic laryngitis in singers, who complain of a feeling as if there were something clogging the larynx. Hoarseness, and sometimes loss of voice. Muco-purulent sputum, which may be blood-tinged.

Carbo vegetabilis is indicated when catarrhal troubles are provoked by warm moist atmosphere, damp evening air, or by talking. Dry, tickling cough, at times quite spasmodic in character; deep rough voice, failing if exerted, but without pain in the throat.

Causticum.—Hoarseness, worse in the morning, and aggravation in dry cold weather. Sudden loss of voice in singers and speakers; the laryngeal muscles do not perform their function, and there is inability to speak above a whisper. Cough dry, harsh, rough, and paroxysmal, aggravated at night when lying down. Patient can not çough deep enough for relief.

Kali bichromicum.—Laryngeal catarrh, with very tenacious, tough expectoration. Hoarseness, rough voice, and barking cough. Mucus tough as pitch; threatens to suffocate on account of its being so stringy.

Manganum.—Laryngitis, with great accumulation of mucus; rough, hoarse voice, which is worse in the morning. Cough from loud reading, with painful dryness and roughness in the larynx; cough is usually relieved by lying down. A valuable remedy for anæmic persons who are predisposed to catarrhal troubles.

Paris quadrifolia.—Hoarseness, with continuous hawking of mucus, and with burning in the larynx. Laryngeal catarrh, with expectoration of green, tenacious mucus, mostly in the morning.

Sanguinaria.—Aphonia, with feeling of swelling in the throat as though the patient would choke. Laryngitis, with soreness, dryness, and sometimes expectoration of thick mucus. A wheezing-whistling cough, aggravated by lying down; scanty glairy expectoration.

Selenium.—Voice husky when beginning to sing, or from talking long; frequent necessity to clear the throat of transparent, starchy mucus. Cough, with scraping in chest and bloody expectoration.

Sulphur is especially indicated in chronic cases. Rough, hoarse voice, and rawness in the larynx; aphonia, worse in the morning. Laryngeal catarrh, with attacks of suffocation.

LARYNGEAL ŒDEMA.

(SYNONYMS: *Œdematous Laryngitis; Phlegmonous or Submucous Laryngitis; Dropsy of the Laryux; Œdema of the Glottis.*)

Œdema of the larynx is seldom, if ever, idiopathic; it usually follows or accompanies inflammatory affections of the larynx or of the adjacent tissues, or a constitutional affection. It may be either inflammatory or non-inflammatory. It may arise from septic influences, erysipelas, pyæmia and septicæmia, deep-seated cervical abscesses, laryngeal perichondritis, amygdalitis, parotitis, in the exanthemata; also from traumatic causes—the swallowing of corrosive liquids, scalds, burns, sharp foreign bodies, etc —and from syphilitic or tuberculous ulcerations of the larynx. Cases are reported of laryngeal œdema having been caused by the continued use of iodide of potassium, iodine, and mercury.

Laryngeal œdema is rare under fifteen years of age, most cases occurring between the ages of eighteen and fifty; it occurs more rarely in women than in men, and those who have been enfeebled by disease or great bodily fatigue are more liable than the healthy and robust.

The **symptoms** vary with the situation and degree of the disease. In some cases there are no symptoms whatever prior to a paroxysm of strangulation; suffocative breathing may be the first indication of its occurrence. The most prominent symptom is dyspnœa, which at first is more or less paroxysmal, and is mainly limited to the act of inspiration. Early in the attack there is a sense of constant oppression, as if a foreign body were wedged in the larynx, causing a feeling of impending suffocation. As the œdema increases both acts of respiration are interfered with; the patient's efforts to breathe are then frightful to witness, and death supervenes unless operative relief is immediately afforded. The voice is hoarse and rough, and in some cases totally extinguished. Cough is dry and short, and is apparently due to a constant inclination to rid the upper part of the throat of some mechanical impediment. Dysphagia is most marked when the epiglottis is the main seat of the affection; swallowing is difficult and painful, and sometimes impossible without choking and regurgitation through the nares.

Pathology.—The effusion in laryngeal œdema is usually of a serous or sero-purulent character; sanguineous effusion is limited to traumatic cases. Infiltration occurs in those localities in which the connective tissue is most abundantly interposed between the mucous membrane and the cartilages—*i. e.*, the ary-epiglottic folds, the glosso-epiglottic ligament, at the base of the epiglottis, the ventricular bands, and in the inter-arytenoid space. Infiltration of the submucosa *beneath* the vocal bands, or infraglottic œdema, is never an extension of the supraglottic, is almost invariably secondary in origin, subacute in intensity, and is very slow to subside.

Diagnosis.—Laryngoscopical examination or digital exploration, when practicable, will readily establish the diagnosis. The history of the case, the suddenness of its occurrence, and the peculiar inspiratory distress are valuable diagnostic aids.

The **prognosis** depends upon the conditions under which the œdema develops; as a rule it is very unfavorable, especially in cases of acute blood-poisoning—cervical cellulitis, erysipelas, etc. The duration of the infiltration varies from a few hours to several days. The patient may expire, asphyxiated, in a few hours from the time effusion took place. The prognosis is more favorable when the effusion is limited to a small portion of the larynx, or is a sequel to pharyngeal inflammation.

Treatment.—Some cases of laryngeal œdema may be controlled by counter-irritation, the internal and external use of ice, hot applications to the neck, or soothing and astringent inhalations. Scarification should be practised when dyspnœa is urgent—this is an operation requiring an experienced hand. Intubation may be tried, but in serious cases little should be expected from this operation, and it should be remembered that tracheotomy will be the more successful the earlier it is performed. To be effective it should be done before the laryngeal stenosis has caused grave symptoms of asphyxia. In this disease the inter-crico-thyroid membrane should be selected as the place of insertion for the tube, as in this situation the operation can be more quickly, easily and safely made.

Local treatment is of most importance. For internal medication, consult **Apis, Arsenicum, Belladonna, Lachesis, Stramonium.**

CHRONIC LARYNGEAL ŒDEMA may precede or follow the acute, or arise independently, the latter being the most common. Non-inflammatory œdema may arise as a result of venous distention—as seen in valvular heart disease—and from compression of the veins returning from the larynx, by tumors, cysts, goitre, etc. Pulmonary emphysema, dropsical affections associated with kidney diseases, may terminate fatally through an attack of laryngeal œdema. In chronic œdema there is a great liability to sudden accessions of the acute form of the disease. External applications of cold or counter-irritation are required; also inhalations from a hot water inhaler of compound tincture of benzoin, one teaspoonful to a pint of water, or creosote, fifteen minims to a pint of water.

EXUDATIVE LARYNGITIS.

(SYNONYMS: *Croupous or Membranous Laryngitis; Cynanchea Trachealis; True Croup.*)

Exudative laryngitis, or *croup*, which term is of Scottish origin, and means strangulation, is an acute inflammation of the mucous membrane of the air-passages, attended with a pseudomembranous exudation. There is a diversity of opinion as to the identity of exudative laryngitis and laryngeal diphtheria. The writer coincides with those who believe that these two diseases are distinct, for the reason that exudative laryngitis is a non-contagious and non-infectious disease of the larynx, is local in its nature, the exudation is *on* and not *in* the mucous membrane, and by the absence of serious complications and sequelæ.

Etiology.—The disease is especially one of early childhood, attacking male children by preference, occurring most frequently between two and seven years of age, and rarely later than the second dentition. Croup affects children of certain families, and certain children of some families, more than others. Where there is no diathetic peculiarity, some aberration from health is a usual predisposing cause. Delicate, weakly, and ill-nourished children are more liable to the inflammatory form, while healthy and robust children are subject to the spasmodic form of the disease. The disease is quite prevalent throughout the year, but it is more common in the winter and spring. Exposure to cold and moisture, with rapid alternations of temperature, are among its most frequent exciting causes. It sometimes arises during the course of scarlet fever, small-pox, and especially measles.

Pathology.—The mucous membrane of the larynx and trachea is usually intensely red and somewhat swollen; the submucous tissue is but slightly affected, and is rarely the seat of effusion. The false membrane is a layer of lymph of variable thickness, white, yellow, or ash-colored, lining the larynx and trachea, sometimes extending even to the smaller bronchi. Where a more fibrinous exudation completely fills the trachea its free surface is glazed by a layer of pus or of muco-purulent secretion, the other surface being more or less adherent to the mucous membrane. The false membrane may be limited to a few patches, or it may form cylindrical pieces, presenting perfect moulds of the tubes. It varies in thickness; in the larynx it is thinner than in the trachea. The false membrane may be cast off as such in the form of a cylinder, bands, or shreds. In some cases it rapidly forms again after expulsion. The bronchi show traces of inflammation in their whole extent. Both lobar and lobular pneumonia frequently coexist, and vesicular emphysema may be present in some portions of the lung.

Symptoms.—The invasion of the disease is sometimes sudden; often the initial symptoms are those of a simple cold—some feverishness, thirst, coryza, slight sore throat, hoarseness and cough. These symptoms may continue for a day or two, when the characteristic cough and croupal respiration are perceived. The child is wakened suddenly, generally about midnight, with a loud, resonant, metallic cough and difficult, wheezing respiration. This paroxysm gradually abates after a few minutes; the respiration becoming more easy the child falls asleep again. These attacks may recur during the night. During the day there is a general remission of the symptoms. At this time the pulse is rapid, full and hard in character, the head is hot and red, and the temperature may range from 102°–105° Fahr. As the disease advances the voice becomes hoarse and whispering, often is entirely lost, and the cough becomes stridulous; the dyspnœa increases and becomes permanent instead of paroxysmal, inspiration especially being prolonged. The suffocative attacks are now more severe and oft repeated. The patient is restless and excited, it can not lie down, and makes constant efforts to grasp the throat as if to remove some obstacle. The head is thrown back, the face is flushed and swollen, the nostrils are dilated, the accessory muscles of respiration are brought into action, and suffocation, with its fearful agony of anxiety and suffering, threatens the life of the patient. Sometimes these urgent symptoms are relieved by the expectoration of pieces of false membrane. There is then a general amelioration of all the symptoms; the breathing becomes freer, cyanosis disappears, the patient passes into a quiet sleep, and recovery seems assured. As the exudation may be reproduced, however, within a few hours, little confidence should be placed in such remissions while there is a continuance of the inflammatory process.

Diagnosis.—It is important to distinguish between exudative laryngitis and pseudo croup or laryngismus stridulus. In the former the symptoms collectively are, the ringing cough, the peculiar respiration, paroxysmal aggravation of the dyspnœa, the changed voice, the fever, and the expectoration. In pseudo croup the attack usually occurs at night, it is not preceded or accompanied by active febrile symptoms, and the breathing in the interval of the attacks is tranquil. Laryngoscopic examination is difficult and rarely successful. In such cases as have been examined the false membranes were seen, accompanied by thickening and diminished mobility of the vocal bands and consequent stenosis of the larynx.

Prognosis.—In cases which terminate favorably the interval between the paroxysms of suffocation increase, the dyspnœa is perceptibly diminished, the character of the cough and voice improves, the expectoration is more profuse, and the fever disappears. Recovery is slow, and several weeks may elapse before the patient will be exempt from paroxysms of dyspnœa.

In cases which proceed to a fatal termination the dyspnœa becomes more violent, the respirations are shallow and frequent, the pulse is rapid and weak, the body is covered with a cold, clammy sweat, the somnolence deepens into coma, or convulsions supervene and end the struggle. In fatal cases the duration of the disease is from three to seven days.

Diet and Hygiene.—The patient's strength should be carefully guarded, and requires early support. Water, milk, and farinaceous food, beef-tea, chicken broth, Wyeth's or Valentine's beef-juice and such nourishment should be given. If disagreeable, or tending to excite spasm in deglutition, it may be necessary to adminster the nourishment by enemata. The air of the chamber should not rise above 70° Fahr., nor allowed to fall below 65° Fahr. In special cases it may be advantageous to steam the room. The steam may be diffused by placing a long roll of thick paper or a tin tube over the spout of a kettle of boiling water. While appreciating the necessity of protecting the patient from cold, the urgency of the necessity for admitting an abundant supply of pure air into the room must not be lost sight of. Oxygen may be supplied to the patient direct from cylinders as supplied by the manufacturers of the product.

Treatment.—In this form of laryngeal disease intubation and tracheotomy are valuable and often successful expedients. Intubation is of most value when the disease is limited to the larynx. If the exudation has extended to the trachea and bronchi tracheotomy is necessary, and the result is more favorable if the operation be made early. The induction of vomiting, by the administration of emetics, as practiced by some members of the profession, is reprehensible. The general depressant action of emetics, added to the depression of the disease, is likely to cause injury to the patient.

Aconite is useful in the first stage of the disease ; there is high fever, great difficulty of breathing, anxiety and restlessness. Cough is of a hard, dry, barking character ; it hurts the larynx.

Iodum is useful in the early stage, and follows Aconite well when the anxiety and restlessness are relieved. Cough is dry, hard, and croupy ; dry hot skin ; great difficulty in respiration. Voice has a deep, hoarse, rough sound.

Belladonna and **Ferrum phosphoricum** may also be found useful in the early stage.

Bromium is indicated after subsidence of febrile symptoms. Dry, tight cough ; deep hoarse voice, and rattling of mucus in larynx—seems as if cough would clear it out. Each inspiration provokes cough. Loss of voice ; excessive suffocation ; constriction in the larynx.

Hepar sulphuris calcareum is indicated after subsidence of fever. Hoarse, croupish cough—it has a slight *loose edge ;* the expectoration is slight ; profuse collection of mucus ; difficult respiration. Aggravated by least draft of air ; constant perspiration.

Kali bichromicum.—Constant sawing respiration ; harsh, rough voice ; hoarse, barking cough ; the expectoration is very tenacious and gags the patient, who sometimes tries to vomit. Indicated in fat, sluggish children.

Antimon. et Potass. tart.—When there is a sound as if there were a large quantity of mucus in the air-passages, while none is expectorated ; apparent danger of suffocation, and great sinking of strength.

Sanguinaria canadensis.—Dryness, soreness, and swelling in the larynx ; wheezing-whistling cough ; stridulous breathing ; extreme dyspnœa.

Consult **Arsenicum jodatum, Ammonium, Drosera, Kali muriaticum, Lachesis, Phosphorus, Sambucus.**

TUBERCULOUS LARYNGITIS.

(SYNONYMS: *Phthisis Laryngea; Throat Consumption.*)

This disease is characterized by the development, in the interior of the larynx, of an ulcerative process, involving not only the mucous membrane, but also, frequently, the perichondrium and cartilages.

Etiology.—The causes are the same which give rise to the pulmonary tuberculosis. There is a large class of persons who have inherited or acquired a peculiar delicacy of constitution, and manifest a greatly diminished power of endurance; such persons are prone to various forms of disease. They are especially liable to severe colds, irritations and inflammations of the mucous membrane lining the air-passages that are very slow in their resolution. Males show a greater proclivity to the disease than females; this is unquestionably due to their more frequent exposure to inclement weather and catarrhal influences, which is a prominent factor in the production of this disease. No age is exempt, but the period between twenty and thirty-five years is most prolific. In some instances tuberculous laryngitis may occur as a primary lesion, but it is probable that latent pulmonary disease preceded the laryngeal affection. It may occur coincidently with, or at a considerable period after, the commencement of the pulmonary affection. Cohen asserts that in primary tuberculous laryngitis a severe catarrhal process with exfoliation of the epithelium is the direct predisposing cause, and exposure, in some way or other, to the tubercle bacillus the exciting cause. Virchow is most definite in his statement that phthisis laryngea is due to tubercularization of the larynx. Secondary tuberculous laryngitis, then, is due to pre-existent pulmonary tuberculosis, and the transference of bacilli through the blood- and lymph-channels the direct exciting cause. Lennox Browne states that it must not be forgotten that in tuberculous patients a laryngitis may occur which is non-tuberculous—one which does not depend upon the presence of tubercle in the larynx—and such a laryngitis offers little to distinguish it from an ordinary inflammation, except that it is less amenable to treatment.

Pathology.—The structural changes occur in the different parts of the larynx as follows: in the inter-arytenoid space, the arytenoid cartilages or ary-epiglottic fold, the epiglottis, vocal bands, and ventricular bands. Thickening of the tissue, either general or circumscribed, constitutes the actual first stage of laryngeal tuberculosis. The tubercular deposit is found most commonly in the sub-epithelial layer of the mucous membrane, and sometimes in the superficial portion of the sub-mucosa.

Ulceration is the usual result of tubercular deposit in the laryngeal mucous membrane. Tubercular ulcers are shallow, often multiple, beginning in minute points, and tend to spread superficially and by coalescence rather than deeply. It has been demonstrated that tubercular ulcers originate from *within*, not from without; no tubercles are found free on the surface, except where it is ulcerated. A continuance of the ulcerative process may involve the perichondrium of the cartilages, with resulting perichondritis and caries or necrosis. Perichondritis and chondritis, which are the result of inflammatory processes of septic origin rather than a direct result of the tuberculous process, occurs in the later stages of protracted cases.

Aside from the fungous vegetations which are sometimes developed upon the edges of ulcerating tissues, and the papillomatous excrescences in the inter-arytenoid fold, there is a special neoplasm, peculiar to tuberculous laryngitis, which varies in size from pin-heads to that of cherries. This neoplastic tissue corresponds more with excessive granulation growth than with veritable tumor, is easily removed—indeed, is sometimes expectorated in coughing—and recurs quickly when removed.

Symptoms.—The subjective symptoms vary with the character and location of the lesion. Tuberculosis may exist for a considerable period of time before the characteristic local or constitutional symptoms appear; then, again, it may develop suddenly, and rapidly proceed to a fatal termination. One of the earliest manifestations of the disease in the larynx is observed in the voice, which is weak and changes quickly on making any considerable or prolonged effort; hoarseness shortly becomes constant, and eventually the voice loses its tone, the patient speaking with difficulty in a husky whisper. Dysphonia is usually present in the early stages, complete aphonia in the later.

The cough varies in different stages. At first there is an occasional dry and hacking cough, which is ascribed to a tickling or scratching sensation in the larynx. The cough is more frequent and painful as the disease advances, and the ulceration occurs at points which are especially disturbed in the acts of cough and expectoration. The quality and amount of expectoration varies, and depends on the condition of the bronchial tubes and the lungs rather than on that of the larynx.

Respiration is not markedly affected until the laryngeal lesions are somewhat advanced. In the last stage the dyspnœa may be so great as to necessitate tracheotomy.

Discomfort and pain on deglutition are marked symptoms when the epiglottis is involved, or when the ulcerative process occupies the posterior wall, or the region of the pharyngo-epiglottic fold. The difficulty in swallowing saliva and fluids is greater than when solids or semi-solids are taken; the former may pass downwards into the larynx or regurgitate through the nares. In some cases the pain caused by the effort in swallowing is so intense as to cause the patient to reject all food. In the early stages there is but little pain; and even later, when the parts are at rest, the absence of pain is quite remarkable.

Though the emaciated condition of the patient, the chronic cough, the fever, huskiness of the voice, shortness of breath, and the dysphagia may point directly to tuberculosis of the lungs and larynx, it is very important that the lungs be examined and the larynx carefully inspected. Tumefaction of the larynx due to tubercular infiltration is easily recognized by the pale, boggy, semi-opaque, partly œdematous, partly inflammatory, swelling of the arytenoid cartilages, giving them a "club-shaped" appearance. In those cases where the epiglottis becomes infiltrated and swollen it appears "turban-shaped."

It is unnecessary to describe the appearances of the many-shaped ulcerations of laryngeal tuberculosis in their stages of progress. It should not be difficult to recognize the grayish ulcer of tuberculosis, covered with a thin but clinging secretion, presenting feeble indications of inflammatory action, hardly depressed at all below the surface, spreading laterally but not in depth, and uniting with other small ulcerations. The destructive process is slow as compared with that of the syphilitic ulcer, which is usually deep, has a sharply localized periphery surrounded by an inflammatory areola, and secretes pus.

Marked pallor or local anæmia of the laryngeal mucous membrane, which may be associated with similar pallidity in the mouth and pharynx, but which is wholly independent of the paleness indicative of general anæmia, is to be regarded with suspicion. In some cases of laryngeal tuberculosis the local anæmia is followed by congestion, while in others the ashy hue continues to the very last. Congestion of the arytenoid cartilages, and the slightest appearance of bogginess in them, is significant. Localized congestion should incline the observer to suspect incipient tuberculosis as being indicative of the seat of infiltration prior to the stage of tumefaction.

Diagnosis.—The disease is readily recognized when, by means of the laryngoscope, the characteristic swelling or pyriform thickening of the ary-epiglottic folds and the typical ulceration of the epiglottis or other parts are presented to view. Tuberculous laryngitis is to be distinguished from acute œdema and syphilis. In acute œdema the semi-transparent character of the swelling, the rapid occurrence and short duration of the disease, will differentiate it; in syphilis the ulcerative process is more active, there is less thickening, and the pain is less marked. Tubercular ulcers usually are posterior, and begin low and ascend, in contradistinction to syphilis, which begins higher and descends; cicatrization and contraction take place in syphilis, but rarely in tuberculosis. Although rare, syphilitic and tubercular ulcers may be side by side and differentiation of the gross lesions impossible. The finding of anatomic tubercles containing the bacillus affords the necessary evidence.

Prognosis.—The prognosis is grave when there is much infiltration, where there are numerous scattered ulcers, and where the progress of the pulmonary and of the laryngeal lesions is equally rapid. The disease runs a much more rapid course when the epiglottis or ary-epiglottic folds are infiltrated or ulcerated than when the vocal bands or ventricular bands are the seat ot the disease, mainly because of the interference with the act of deglutition and of the distressing dyspnœa. In certain cases cicatrization of the ulcers in the larynx is effected, and the disease is apparently arrested, to be followed, sometimes, after several years, by a renewed activity in the morbid process.

Treatment.—The general treatment, which embraces the administration of medicinal remedies, attention to diet, hygiene, climate, etc., should be followed out with the same judgment and persistence that characterize the treatment of pulmonary tuberculosis. The larynx should be allowed to *rest*, by abstention from conversational and other vocal efforts.

Consult **Arsenicum album, Arsenicum iodatum, Baptisia, Calcarea carbonica, Calcarea phosphorica, Drosera, Ferrum phosphoricum, Iodum, Ipecacuanha, Jaborandi, Kali carbonicum, Kali muriaticum, Kreosotum, Mercurius nitrosus, Nitric acid, Phosphorus, Selenium, Stannum.**

Local soothing applications are of benefit in the early stage, before any definite tubercular deposit is observed. Inhalations of solutions of pine oil, eucalyptus, conium, and belladonna have been recommended, but tincture benzoini compound, one teaspoonful in pint of water at about 140° Fahr., is usually most serviceable. The patient should not go out of doors after using steam inhalations, as they predispose to acute colds. As a spray the following will subdue the pain and cough : Menthol, xx to xl grs.; Morphinæ, grs. v ; Benzoinol, one ounce.

Insufflations of iodoform, iodol, tannin, morphine, etc., in various combinations, have been followed by results satisfactory and otherwise. A powder composed of bismuth subnitrate and benzoini resin, of each grs. xxx, and iodol one drachm, when applied to the affected parts causes an excellent soothing effect.

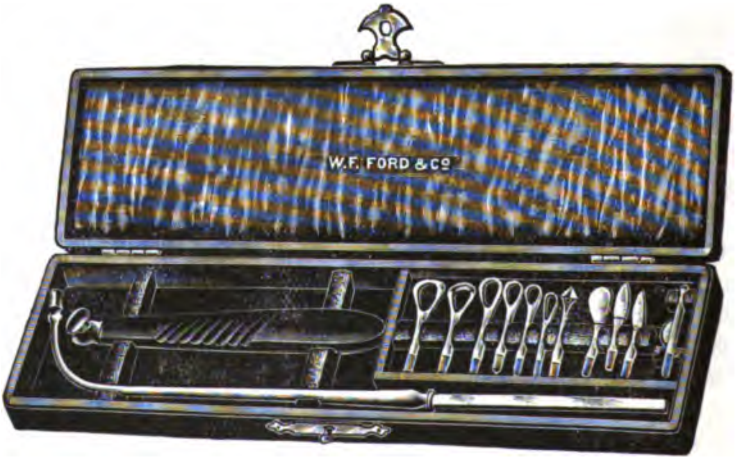
Rosenberg suggests the injection, into the infiltrated tissues, of a twenty per cent. solution of menthol in olive oil, by means of a suitable syringe, beginning with fifteen minims, and increasing the amount to the degree of tolerance. It is stated that it acts as an antiseptic, anæsthetic, and stimulant, diminishing the cough and relieving the pain.

Chappell recommends Creosote (beechwood), ol. gaultheriæ, each two drachms ; ol. hydrocarbon, one drachm ; ol. ricini, three drachms. The submucous injection of creosote should be preceded by the application of a ten per cent. solution of cocaine.

Pure creosote is used when there is extensive tissue necrosis, the injection being made as superficially as possible, one drop at a time, repeated at intervals of five or six days.

Various other remedies (bromoform, formaldehyde, guaiacol, protonuclein, pyoktanin, aristol, etc.) have been locally applied, and in certain cases the results have been encouraging. Very favorable results have recently been reported from the application of parachlorphenol in ten to twenty per cent. of glycerine solution. It has decided germicidal and healing properties, and it is stated that its soothing action is more prolonged than even that of cocaine.

Electrolysis and galvano-cautery have been employed in the treatment of hard infiltrations, especially of the ventricular bands, but the beneficial action has been very slow. Because of the difficulty of manipulation and the length of time requisite to accomplish the desired result these measures have been superseded by curettage.



Krause's Laryngeal Curettes.

When ulceration has occurred the most rational method of treatment is the application of lactic acid, which may be used in solution of from ten to eighty per cent. strength. The application of the acid should at all times be localized to the exact part implicated. In all cases a previous application of a ten or twenty per cent. solution of cocaine should be made, until the larynx is completely anæsthetized.

Heryng, of Warsaw, devised the surgical treatment of laryngeal tuberculosis by curettement, and introduced the use of the simple curette and the rotary curette; Krause, of Berlin, introduced the double curette. Single curettes are best adapted for cleansing and scraping of ulcerations; double and rotary curettes are employed for excision of tuberculous infiltrations. Dense infiltrations, which are usually localized, are more favorable for operation than œdematous conditions. The object of curettage is to limit the tubercular infiltration, to clean ulcerations and to endeavor to convert a tubercular ulcer into one which is benign.

Curettement is contraindicated in very weak patients with advanced lung disease and hectic; in very nervous patients; in those with disseminated tuberculosis of the larynx, and in those who would be much depressed by an aggravation of local pain for a few days.

The success of surgical procedure depends upon the site of the lesion, the thoroughness of the operation, and the after-care. Thorough application, with distinct friction, of lactic acid, the ulcerations having been previously curetted, is of the highest value.

Tracheotomy can only be considered in the light of an auxiliary, and it should only be performed in cases of urgent dyspnœa. Dr. Shurly has recently suggested that in certain cases it may be advisable to make a tracheotomy previous to curettement of the larynx, as by this plan the operator may take all the time necessary for proper manipulation without increasing the dangers arising from laryngeal spasm, laryngeal hæmorrhage, or subsequent laryngeal swelling.

SYPHILITIC LARYNGITIS.

(SYNONYMS: *Syphilis Laryngis; Syphilis of the Larynx.*)

This affection is due to constitutional syphilis, either inherited or acquired. John N. Mackenzie states that laryngeal affections in congenital syphilis are among the most common and characteristic of its pathological phenomena, and that the invasion of the larynx may be looked for with the same confidence in the congenital as in the acquired form of the disease.

Congenital syphilitic laryngitis occurs mostly within the first year of life. The disease may be limited to the mucous membrane, and perhaps the submucosa. In other cases it is characterized by deep ulceration of an extremely acute nature.

The voice will vary from slight huskiness to the toneless whisper of absolute aphonia. The cough is rough, harsh, suffocative and paroxysmal, the paroxysms being generally worse at night. Respiration is more or less disturbed, according to the amount of obstruction. Deglutition is difficult, and sometimes painful and impossible. Laryngismus occurs quite frequently, and is sometimes the immediate cause of death.

The **diagnosis** may be involved in doubt if laryngoscopic examination be impossible. The hereditary history, cutaneous manifestations, syphilitic inflammation of the nasal mucous membrane, and other symptoms may serve to establish a diagnosis.

The **prognosis** of hereditary syphilis varies in accordance with the extent and severity of the lesions, the time of their manifestation, and the general condition of the child.

Consult **Aurum metallicum, Fluoric acid, Kreosotum, Hepar sulphur, Mercurius iodatus ruber, Mercurius iodatus flavus, Mercurius solubilis, Nitric acid, Phytolacca, Sulphur, Thuja.**

The laryngeal lesions of acquired syphilis may assume the character described as secondary and tertiary. Primary syphilitic laryngitis is very rare. Syphilitic laryngitis is usually consecutive to inflammatory changes in the upper respiratory tract, which are generally slow to recover. It is more frequently met with in the male sex, between the age of twenty and forty.

Lennox Browne observes that the hyperæmia of secondary syphilis, while apparently less superficial nor so vivid in color, is more persistent than in simple chronic inflammation. In many cases it presents a mottled discoloration, seen most distinctly on the vocal bands, which are more or less congested, in patches of varying intensity, the non-hyperæmic portions being of a grayish tone.

M. Mackenzie has stated that condylomata are the most characterized conditions of secondary syphilis, and describes them as being uneven, whitish, smooth or jagged papillary formations, various in size and extent, and found most frequently in the posterior commissure and on the free edge of the epiglottis.

Mucous patches are found most frequently on the ventricular bands, on the lingual surface of the epiglottis, the posterior commissure, and the ary-epiglottic folds. The true mucous patch is a flat papule surmounted with a sodden epithelium, grayish-white in color, sometimes red and granulating, covered with a more or less puriform secretion. Mucous patches vary in size, and by confluence may reach almost any dimension.

They do not leave any scars unless they ulcerate, and even then, the ulceration being superficial, the scars are not well marked. They are painless unless they ulcerate, and they relapse frequently, reappearing spontaneously, or more often, as the result of local irritation. Syphilitic laryngeal disorders, when they have lasted some time, are nearly always complicated by the formation of ulcers. These ulcers are superficial, and heal after a few weeks' treatment.

The **symptoms** of secondary syphilitic laryngitis generally occur from six months to two years after the primary infection, and they vary in proportion to the amount of tissue involved and the parts directly affected. The voice is generally impaired, being easily affected by exposure or vocal exertion, becoming persistently hoarse and husky, and sometimes progressing into complete aphonia. Except when swallowing, or when the use of the voice requires effort, pain is seldom experienced. Cough may be present, but it is usually induced by talking or eating, or the presence of viscid secretion in the larynx. There is seldom any difficulty in respiration, except when the inflammation has extended to the trachea and primary bronchi.

Prognosis.—Under early and appropriate treatment a speedy cure is usually effected, though the hoarseness may be persistent and the singing voice irrecoverably lost. There is an extraordinary predisposition to relapse when subjected to the causes of catarrhal inflammation.

Treatment.—Overuse of the voice should be inveighed against, and the use of alcohol and tobacco interdicted. Local applications of zinci chloridi, twenty grains, to water, one ounce; or cupri sulphatis, fifteen grains to water, one ounce, are of signal benefit to relieve the inflammation. Where there is actual ulceration, nitrate of silver may be employed.

For internal remedies, see treatment of tertiary laryngeal syphilis.

TERTIARY SYPHILIS.

The tertiary manifestations of syphilis may develop three or four years after the primary affection, and it is not unusual to observe cases in which they are delayed twenty or thirty years. The distinctive lesions of this period are gummata, rapid and deep ulceration, and cicatricial contraction.

Gummy tumors may appear in any portion of the larynx, but they are usually found in the submucous tissue of the free border and posterior surface of the epiglottis, on the ventricular bands, and the inter-arytenoid folds. A gumma first appears as a round, submucous, insensitive swelling. Its growth may be slow at first, but it is often rapid from the start. After the tumor has reached a certain size the mucous membrane over it becomes œdematous and rapidly gives way, disclosing a cavity which constitutes a gummatous ulcer. The ulcers may start upon the surface and eat in, or a gumma may form beneath the perichondrium of a laryngeal cartilage and eat out; in either case a portion of the cartilage is liable to be involved in necrotic changes, and to exfoliate. The final cicatrization after cure in these cases may impair the mobility of the vocal bands, and to form a stenosis of the rima glottidis, which may become so extreme as to demand the performance of a tracheotomy. The epiglottis is especially liable to be affected by syphilitic ulceration, and when the walls of the pharynx are also ulcerated there is danger of the edges of the epiglottis uniting with the pharynx, which condition will cause a most serious form of dysphagia.

Diagnosis.—In syphilitic laryngitis it may be difficult to distinguish between simple chronic inflammation, but the previous history, the laryngoscopic appearances, and the progress of the case will soon make evident the nature of the affection. In tertiary syphilis the ulcers are to be distinguished from laryngeal tuberculosis and from cancer.

In tubercular laryngitis there is fever, rapid pulse, and emaciation; in syphilis these symptoms are wanting. In tuberculosis the ulcers are superficial, the edges are irregular and poorly defined, they develop slowly, and are painful. Tubercular laryngitis is invariably associated with signs of pulmonary tuberculosis.

In cancerous laryngitis the growth precedes the ulceration, the adjacent membrane is acutely inflamed, and there are almost always nodular excrescences upon or around the ulcer.

Prognosis.—When the case is brought under prompt and appropriate treatment the disease can be arrested. When the perichondrium or the cartilages are involved there is great danger to life from œdema of the glottis, or by hemorrhage. When the vocal bands are implicated the voice will be permanently hoarse, or it may be lost. In cases of stenosis requiring tracheotomy, the patient will probably be obliged to wear the canula for life.

Treatment.—In the tertiary stage local applications are very important to promote the healing process and to lessen the pain. The ulcerations having been cleansed, by means of a brush or cotton-wrapped probe, of any coating of secretion, a ten per cent. solution of cocaine should be applied prior to touching the ulcerated surface with the solid nitrate of silver melted on the end of a suitably curved silver probe; or the nitrate of silver may be used in solution, varying in strength from twenty-five per cent. to a saturated solution. Applications should be made daily, and always with the aid of the laryngoscope.

When the epiglottis is ulcerated the galvano cautery has been successfully employed.

When extensive ulceration has been followed by cicatrization the question of operation must be determined by the urgency of the symptoms and the difficulties and the dangers attendant thereon. In some cases it is absolutely necessary, and in other cases it may be desirable, to perform tracheotomy before proceeding to any other operative measure.

Various methods have been advocated for overcoming cicatricial contractions. Schroetter advises that the larynx be systematically dilated by means of hollow tubes of gradually increasing dimensions, the tubes to be retained in position for from fifteen to thirty minutes. Syphilitic stenosis is very liable to recur after dilatation.

O'Dwyer's laryngeal tubes have been employed, with admirable results, in some cases of stenosis.

Membranous formations should be divided, as recommended by Dr. Whistler, who devised a cutting dilator, which consists of an olive-shaped body, within which is a concealed blade. The knife is so arranged that it can be reversed, so that it may cut a stricture at either the anterior or the posterior commissure of the larynx. After division of the web, intubation tubes may be worn to prevent reunion of the web.

The most important remedies are: **Aurum, Cinnabaris, Iodum, Kali bichromicum, Kali iodatum, Lachesis, Mercurius corrosivus, Mercurius iodatus ruber, Mercurius iodatus flavus, Mezereum, Nitric acid, Sanguinaria, Thuja.**

PERICHONDRITIS OF THE LARYNX.

Perichondritis—inflammation of the perichondrium—of the laryngeal cartilages is occasionally the result of the extension of diseased conditions from the overlying mucous membrane. Idiopathic perichondritis of the larynx is rare, and is usually due to traumatic occurrences, as throat-cutting, decubitus, or other pressure upon the part—as the frequent introduction of the œsophageal sound in the aged. It more commonly follows tubercular and syphilitic ulceration, and advanced malignant disease of the larynx; not infrequently it appears in the course of typhoid fever, small-pox, scarlet fever, and less frequently erysipelas and pyæmia.

Perichondritis must at all times precede chondritis, and it invariably causes the cartilage to become involved in the morbid process. The disease occurs more frequently in men than in women, and oftener between the twentieth and fortieth year than at any other age.

Perichondritis has a great tendency to suppuration, and the suppurative stage rapidly follows the inflammatory unless the latter has been relatively very slight. When the pus, more or less abundant, collects between the cartilage and its investing membrane, the cartilage is denuded and separated from its nutritive vessels, and becomes necrotic. The disease affects the laryngeal cartilages in the order of frequency as named: Arytenoid, cricoid, thyroid, and the epiglottis.

Perichondritis of the arytenoid cartilages, unassociated with any affection of the other cartilages, is the most common form of the disease. In most cases it is of phthisical origin, especially when the larynx has been affected some time. There is marked tumefaction of the affected cartilage, and, in case of abscess, pus will be discharged near the posterior vocal process. Swelling of the arytenoid cartilage involves more or less fixation of the corresponding chord. Perichondritis of the arytenoid may sometimes start in the crico-arytenoid articulation.

In perichondritis of the cricoid, if the posterior surface of the plate is affected, the inflammatory reddening of the mucous membrane may extend upwards to the palate; if the inner plate is involved a swelling can usually be recognized in the subglottic region, pushing up the vocal band.

In perichondritis of the thyroid, if the external surface be affected, the swelling will encroach upon the neck, the abscess pointing externally. If the internal surface is involved the swelling may be in the pyriform sinus and extend beneath the vocal bands.

Symptoms.—Pain of a boring, burning character is referred to the locality of the affected cartilage. There is cough, dysphonia, dysphagia, paroxysmal suffocative attacks, enlarging lymphatics, and swelling of the larynx externally.

Diagnosis.—In many cases the diagnosis is impossible, even with the aid of the laryngoscope, in the early stage of the disease. In the suppurative and necrotic stages the diagnosis is more certain.

Prognosis.—As a rule, the prognosis is very unfavorable. It is possible that the disease can terminate in resolution in the inflammatory stage, though there will be some permanent enlargement of the implicated cartilages. Recovery may ensue even after necrosis and the removal of a cartilage, but deformity and cicatricial contraction are the results; in tuberculous cases death is the usual consequence.

Treatment.—Constitutional treatment is of first importance, and internal remedies should be administered with reference to the underlying cause of the disease. The external application of cold and sucking of ice are indicated in all cases. The abscess, if discernible and accessible, should be opened. When dyspnœa is urgent, tracheotomy must be performed. If a fistulous communication occurs between the larynx and œsophagus, nutritive enemata or the œsophageal tube must be employed. Post-perichondritic laryngeal stenosis requires methodical dilatation.

CALCIFICATION, or ossification, of the cartilages of the larynx is seen in the old, rarely in the young or middle-aged.

ANÆSTHESIA.

The sensibility of the larynx varies so greatly in different individuals that it is difficult to decide when a truly morbid condition has been reached. In partial anæsthesia the sensibility of the laryngeal mucous membrane, even in an otherwise healthy person, may be so diminished as to be tolerant of considerable manipulation without producing reflex spasm. The anæsthesia may be confined to the epiglottis, to one side of the larynx, or to the supra-glottic portion of the larynx ; or it may be complete, involving the pharynx, the entire larynx, and upper portion of the trachea.

Etiology.—Anæsthesia of the larynx is either due to changes in the peripheral nerve trunks, as in diphtheria, syphilis, and injury to the pneumogastric or superior laryngeal nerves ; or it may be a symptom of a distinct structural defect in the nerve-centres, as in locomotor ataxia, paralysis of the insane, bulbar lesions, hysteria, etc. It is present in the later stages of all exhaustive diseases, and it is one of the common manifestations of the general failure of the life-forces. Anæsthesia is generally associated with motor paralysis of the laryngeal muscles.

Symptoms.—Loss of reflex irritability and a failure of the constrictors to protect the larynx from the intrusion of particles of food or other foreign matters is an early and evident symptom. When the anæsthesia is complete both above and below the glottis there may be no cough or spasm to indicate the intrusion of foreign substances into the respiratory tube, and they may then become the exciting cause of pneumonia. In simple anæsthesia the patient experiences no pain or any other discomfort.

Diagnosis.—Usually there are no changes in color or form of the surface. The epiglottis is generally seen to stand upright. The presence or absence of sensibility may be determined by the laryngeal probe or the electrical current.

In all cases due to diphtheria or syphilis the prognosis is usually favorable. When associated with central lesions the prognosis is very serious.

Treatment.—When the anæsthesia is due to peripheral cause the daily application of faradism or galvanism is recommended, the current being sufficiently strong to stimulate but not of sufficient strength to cause pain. The general condition of the patient should receive consideration in reference to suitable treatment. If it be necessary to feed the patient by means of the œsophageal tube, care must be exercised that the tube be not inserted into the larynx, which is a likely danger in general anæsthesia.

HYPERÆSTHESIA.

There may be a hyperæsthetic state of the laryngeal mucous membrane, when it will be found to be abnormally sensitive to touch or to the slightest irritation, even though no local lesion is evident. Persons of a highly neurotic temperament are especially disposed to this affection. Excessive use of the voice, and especially the faulty methods of voice-production, have been found to be most potent causes of the affection. It may result from gastric disturbance, the excessive use of alcohol or tobacco, repeated inflammations of the pharynx and larynx, laryngeal phthisis, and varices at the base of the tongue. It also occurs as a reflex neurosis, and it may be symptomatic of hysteria.

It frequently causes an irritating cough, gagging, spasm, and also convulsions.

PARÆSTHESIA.

Paræsthesia or perverted sensibility in the larynx is commonly hysterical in character; the abnormal sensation often is described as like that of a ball in the throat (globus hystericus).

It may be caused by general neurasthenia, or it depends on a primary injury to the parts by the lodgment of some foreign substance in the air-passage without remaining there, but leaving a persistent impression upon the mucous surface. It may also be a symptom of pathological conditions in the throat, such as hypertrophied faucial, lingual, or pharyngeal tonsils, follicular pharyngitis, and varicose veins at the base of the tongue.

The diagnosis of hyperæsthesia and paræsthesia may be verified by the symptoms, by the aid of the laryngoscope, and the absence of objective manifestations.

Prognosis.—It is noteworthy that disturbances of the sensibility of the laryngeal mucous membrane are frequently very persistent. Their duration is uncertain, but as a rule they terminate favorably under general and local treatment.

Actual *neuralgia* of the larynx is very rare. In the majority of cases the peculiar pain in the larynx of which the patient complains is a symptom of anæmia, and especially of gouty or rheumatic affections. Hysteria may be the cause of neuralgia as well as other forms of laryngeal hyperæsthesia.

Treatment.—Obviously the producing cause should, if possible, be removed. In the hysterical variety of both hyperæsthesia and paræsthesia general treatment is of more value than local measures; moreover, if the physician can confidently assert that his diagnosis is correct and is able to convince the patient that there is absolutely no need for disquietude, but that the affection is simply a morbid *sensation*, a cure is practically effected.

Neuralgia of the larynx will be found to be as intractable to treatment as is neuralgia in other parts of the body, unless the cause be removed.

NERVOUS LARYNGEAL COUGH.

This affection is, by some authors, included in the category of hysterical conditions, but it is frequently associated with hypertrophy of the faucial, pharyngeal, or lingual tonsils; it is not an uncommon reflex manifestation of ovarian irritation in young girls.

The cough, which is paroxysmal, occurs at intervals of a minute or more, and may continue for days and even months, except during sleep. The cough may have a rough, hoarse, harsh sound, or at other times it is shrill and metallic in character.

Consult **Ambra, Belladonna, Carbo vegetabilis, Cina, Cuprum, Drosera, Hepar sulphuris calcareum, Hyoscyamus, Ignatia, Ipecacuanha, Mercurius, Nux vomica, Pulsatilla, Sulphur.**

SPASM OF THE GLOTTIS IN CHILDREN.

(SYNONYMS: *Laryngismus Stridulus; Spasmodic Croup; Child-crowing.*)

Spasm of the glottis, which is the most common of the spasmodic affections of childhood, occurs more frequently among boys than among girls, and is confined almost exclusively to the period between the fourth and twenty-fourth months of age. While poorly-nourished children are especially affected, it is noteworthy that well-developed children are not exempt.

The spasm may arise from a direct local irritation of the laryngeal mucous membrane by a current of cold air, or it may be caused by the passage of liquid into the larynx during the act of deglutition. Among reflex causes may be mentioned difficult dentition, gastric and intestinal disorders, fright, passion, or the pressure of enlarged glands on the laryngeal nerves. It may be central in its origin. Adenoid growths are thought to be responsible for the condition. It is much more frequent in winter than in summer.

The attack is generally sudden, usually occurs at night, without warning, whilst crying, laughing, or drinking, and even on awaking from sleep. During the paroxysm the head is thrown backward, the face is pale and somewhat bluish around the mouth, the veins of the neck are turgescent, the eyes staring, and cold perspiration comes out on the forehead. This condition may last for several seconds, during which time asphyxia seems imminent, when suddenly the closed glottis relaxes and inspiration takes place with a long, "crowing" sound, either continuous or interrupted. The seizure may be single, or the first spasm may be followed by a number of others, and if the complaint is not arrested may end in evidences of cerebral congestion, or death may occur suddenly from asphyxia. General eclamptic spasms frequently occur after the paroxysms.

There is a disturbed action of the pneumogastric or recurrent nerves, either from central or peripheric irritation, due to molecular changes as a result of malnutrition.

Diagnosis.—The suddenness of the attack, the absence of fever and cough, and the suspension of symptoms between the paroxysms will serve to differentiate this affection from true croup or other allied diseases.

Though the majority of cases recover completely, the prognosis should be guarded.

Treatment.—During an attack put the child into a hot bath and pour cold water over the head and shoulders; rectal injection and inhalation of chloroform are often called for. Sometimes the spasm will be relieved by placing the child in a sitting posture, or by bending the body forward and slapping the back. A piece of ice, wrapped in a cloth, applied to the epigastrium or spine is sometimes useful.

Of first importance is the proper treatment of the underlying predisposition, to secure an improvement of the general disordered condition. Protection from cold, salt baths properly administered, the careful selection of an easily digested artificial food (as most of the little patients are bottle-fed children), and a fixed time for the giving of nourishment are all necessary in the attempt to effect a cure. The symptomatic treatment of the reflex irritants occupies a prominent place: constipation, gastric irritation, catarrhal conditions in general should be attended to.

As a rule scarification of the gums in dental irritation is valueless.

Aconitum.—Spasm of the glottis; attack excited by cold dry air.

Iodum is indicated in rhachitic children; swelling of the bronchial glands. After the subsidence of febrile symptoms neither Aconite nor Iodine are seldom indicated.

Belladonna.—Spasm of glottis. Constriction, and painful dryness of larynx; hoarseness, especially when crying (**Aconitum, Phosphorus, Spongia**).

Chlorum.—Sudden dyspnœa from spasm of glottis. Constriction, with suffocation. Crowing inspiration, with obstructed respiration.

Cuprum metallicum is useful when the spasms are general, with the thumbs clenched in the palms. Intense dyspnœa, bluishness of face and lips.

Moschus.—Laryngismus stridulus, attacks excited by eating or laughing. May be given by inhalation at time of attack, to cut short paroxysm.

Consult **Calcarea phosphorica, Ignatia, Lachesis, Sambucus.**

SPASM OF THE LARYNX IN ADULTS.

After puberty spasm of the larynx occurs more frequently among females than among males.

Laryngeal spasm may be caused by the presence of morbid growths or foreign bodies in the larynx, traumatism, syphilis, diphtheria, and it may occur in connection with lesions of the nerve-centers—as tetanus, hydrophobia, chorea, and locomotor ataxia. Sometimes it is associated with hypertrophy of the lingual tonsil, varices at the base of the tongue, nasal obstruction due to hypertrophied turbinates or septal spurs, or elongated uvula. Irritation of one of the recurrent nerves may give rise to an attack, and sometimes the paroxysm may occur during sleep without any apparent cause. It is Dr. Bosworth's belief that attacks of spasmodic closure of the glottis in adults occurring in the daytime, especially when manifesting constant paralysis of one or more of the laryngeal abductor muscles, indicates a central nerve lesion; whereas should the attack occur at night and manifest a temporary impairment of motility in the abductors, it may be regarded as purely "reflex" in character.

The main symptom is a violent and sudden attack of dyspnœa. The attacks are of short duration, and in severe cases is followed by a temporary arrest of respiration. The frequency and severity of the seizures depend on the exciting cause.

Diagnosis.—Inspection by the aid of the laryngoscope, the clinical history, and the suddenness of the attack will render the diagnosis certain. Every effort should be made to ascertain the cause, as death may rapidly supervene if the attack be due to ulcerations, tumors, foreign bodies, locomotor ataxia, etc.

Prognosis.—The great majority of cases recover.

Treatment.—Careful consideration to the condition which has been instrumental in the production of the affection, the use of chloroform, applications of ice or cold water, etc., meet the urgent symptoms, while the administration of appropriate remedies, with attention to a proper hygiene, constitutes the general treatment. Though the vast majority of uncomplicated cases of spasm of the larynx yield to the influence of remedial measures, the question of intubation or tracheotomy should be considered in cases which are intractable, or when due to traumatism or irremovable causes.

THE SUPERIOR AND INFERIOR LARYNGEAL NERVES.

The superior laryngeal nerve is extremely sensitive, and is subject to peculiar conditions of irritation, although it is rarely paralyzed. Irritation of the central portion, and especially of its inner branch, produces an arrest of inspiration and contraction of the expiratory muscles, with simultaneous relaxation of the diaphragm. The internal branch presides over the reflex movements of cough, when a foreign body irritates the laryngeal mucous membrane. In complete paralysis of the superior laryngeal nerve there is anæsthesia of the superior portion of the glottis, paralysis of the depressors of the epiglottis (thyro-epiglottic and ary-epiglottic muscles), and of the crico-thyroid muscles.

Complete paralysis of the constrictor muscles of the larynx is rare. When present, however, the vestibule of the larynx is not closed in the act of swallowing, fluids and solids pass into the larynx, their presence being unheeded because of the anæsthesia of the parts. No reflex irritation or cough occurs to cause the expulsion of the foreign substance, which finds its way to the bronchi and there may become the active element in the development of a bronchitis or a broncho-pnuemonia.

This form of laryngeal neurosis can only be diagnosed by laryngoscopic examination, when the epiglottis will be seen to stand erect against the root of the tongue, the ary-epiglottic folds are relaxed, and the sensibility of the mucous membrane will be found to be diminished.

Faradism and galvanism should be employed to restore the functions of the paralyzed muscles. The patient must be nourished by milk, chicken-broth, or predigested food, which should be injected through an œsophageal tube.

The inferior or recurrent laryngeal nerve is the motor nerve of the larynx, for, with the exception of the crico-thyroid, it innervates all the other laryngeal muscles.

The primary central causes of paralysis of the recurrent nerve include the following: apoplexy, cerebral tumors, multiple paralyses of the cranial nerves, hysteria, diphtheria, and typhoid fever. The peripheral causes include: inflammations, traumatism, cancer, sarcoma, tumors of the lymphatic glands, goitre, pericardial exudations, pulmonary tuberculosis, lesions of the larynx or œsophagus, and aneurism of the aorta, innominata, or subclavian arteries.

Paralysis of the recurrent nerve may be complete or incomplete, unilateral or bilateral. In complete double paralysis (which is comparatively rare) the laryngoscope reveals a cadaveric relaxation of both vocal bands and of the arytenoid cartilages, absolute aphonia, and the expulsion of a large quantity of air when the patient wishes to speak or cough. In adults there is no dyspnœa, except after exertion, but there is inability to cough strongly and to expectorate. When the paralysis is incomplete or unequal on both sides, the appearances are analogous, but the movements of the vocal bands and phonation are still possible to a slight extent.

In forming a **diagnosis** it is sometimes possible to determine the nature of the paralysis by ascertaining its cause. In other cases it is impossible to decide whether the paralysis is traumatic, rheumatic, myopathic, or neuropathic.

The **prognosis** varies according to the nature of the case, and in great part also according to the integrity or abolition of the excitability of the paralyzed muscles and nerves to both faradism and galvanism.

The **treatment** must be directed to the removal of the cause of the paralysis.

PARALYSIS OF THE CRICO-THYROID MUSCLES.

(THE EXTERNAL TENSORS OF THE VOCAL BANDS.)

The crico-thyroidei muscles draw the thyroid cartilage downward over the cricoid cartilage, and thus produce tension and elongation of the vocal bands.

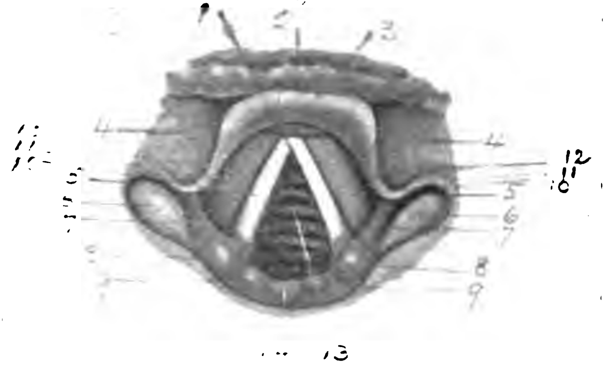
Either bilateral or unilateral paralysis of the crico-thyroidei muscles, as a distinct affection, is of rare occurrence, but when present it is easily distinguished. "On directing the patient to make a vocal sound, and at the same time placing the finger on the outer portion of the crico-thyroid space, the absence of tension on the part of the crico-thyroid muscle can sometimes be perceived."—(M. Mackenzie.) In the healthy condition the contraction of these muscles is so strong that it may easily be felt.

It may be caused by diphtheria, or it may result from injury to the external branch of the superior laryngeal nerve; it may also result from excessive or too prolonged use of the voice.

Symptoms.—The voice is hoarse and monotonous, and sometimes is suppressed; at times there is slight dyspnœa.

The course of the disease depends on the cause. Absolute rest will often suffice to effect a cure. If due to diphtheria it is

Fig 1



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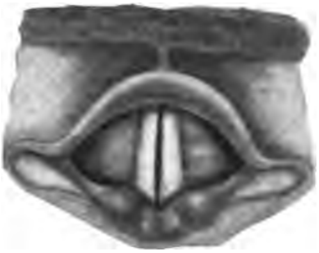

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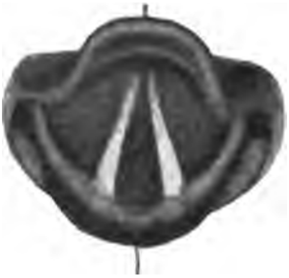

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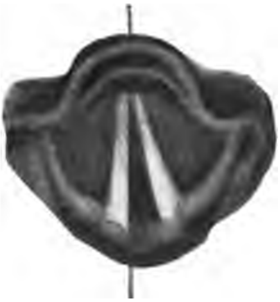

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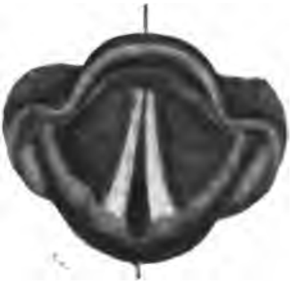

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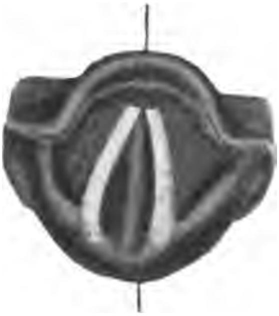

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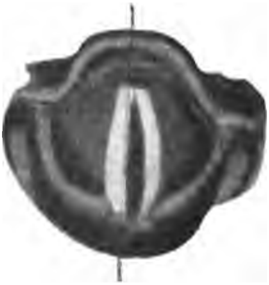

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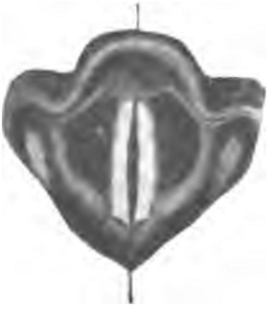

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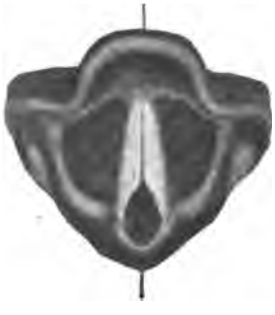


Fig. 10.

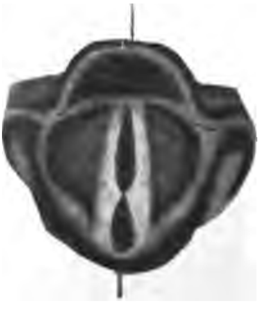


Fig. 1 represents the appearance of a typical larynx in the act of deep inspiration.

1, anterior commissure of vocal bands; 2, cushion of epiglottis; 3, laryngeal surface of epiglottis; 4, lateral glosso-epiglottic fold; 5, pharyngo-epiglottic fold; 6, pyriform sinus; 7, ary-epiglottic fold; 8, cartilage of Wrisberg; 9, cartilage of Santorini; 10, vocal bands; 11, ventricle of Morgagni; 12, ventricular bands (formerly called false vocal chords); 13, trachea; 14, interarytenoid fold.

Fig. 2 represents the larynx in ordinary phonation.

Fig. 3. Bilateral paralysis of crico-arytenoidei laterales and arytenoideus—the adductors. Appearance in attempted phonation.

Fig. 4. Unilateral paralysis of adductors of left chord. Appearance in attempted phonation.

Fig. 5. Bilateral paralysis of crico-arytenoidei postici—the abductors. Appearance in deep inspiration.

Fig. 6. Unilateral paralysis of left abductor. Appearance in deep inspiration.

Fig. 7. Unilateral paralysis of left abductor. Appearance in phonation.

Fig. 8. Bilateral paralysis of the thyro-arytenoidei.

Fig. 9. Bilateral paralysis of the arytenoideus.

Fig. 10. Bilateral paralysis of the thyro-arytenoidei and of the arytenoideus.

probable that the paralysis will disappear with the other morbid phenomena.

Gelsemium.—Aphonia from paralysis of muscles of larynx, especially of post-diphtheritic origin.

PARALYSIS OF THE THYRO-ARYTENOID MUSCLES.

(THE INTERNAL TENSORS OF THE VOCAL BANDS.)

This is one of the most common forms of laryngeal paralysis, and is often associated with inaction of the adductor muscles. The thyro-arytenoidei lie immediately beneath the vocal bands, and their function is to give the requisite tension and elasticity to the free edges of the vocal bands necessary for phonation. They are supplied by the inferior laryngeal nerve.

Paralysis of these muscles is usually the result of improper voice-production, excessive use of the voice, or catarrhal laryngitis.

Symptoms.—The most marked symptom is alteration of the voice; the range of the singing voice, especially in the upper register, is very much reduced. The ordinary voice is weak and hoarse, and if the paralysis be complete it may be reduced to a whisper.

Diagnosis.—The laryngoscope reveals an elliptical opening extending from the thyroids to the base of the arytenoids. The vocal bands and other portions of the larynx are liable to be in a congested state. The history and symptoms will complete the diagnosis.

Prognosis.—The duration of the affection is very uncertain. The prognosis is favorable in cases due to local and removable lesions, but the hoarseness is often persistent.

Treatment.—The use of the voice should be limited to absolute necessities. Intralaryngeal faradization should be employed. Local measures to assist in controlling the catarrhal conditions, internal remedies to meet the special requirements, and plenty of out-door exercise for the patient are recommended.

Ammonium causticum.—Paralysis of larynx, with suffocation, the patient gasps for breath. The general action of Ammonia is to stimulate the respiratory centres in the medulla.

Oxalic acid.—Paralysis of the vocal muscles. Hoarseness and sensation of mucus in the larynx while talking.

BILATERAL PARALYSIS OF THE ADDUCTORS OF THE VOCAL BANDS.

The lateral crico-arytenoid muscles close the glottis by rotating the base of the arytenoid cartilages inwards, so as to approximate their anterior angles. Paralysis of the adductors on both sides causes the vocal bands to remain in a state of extreme *ab*duction. The arytenoid muscle is implicated in this form of paralysis.

Etiology.—This condition is, in most instances, due to hysteria, and is often one of the symptons of anæmia and chlorosis. It is often met with in cases of general debility, and in some cases catarrhal laryngitis is the exciting cause. Affections of the glottis of hysterical origin are met with in patients of nervous temperament, occurring most frequently in females, though men are not exempt. The disease is apparently dependent upon a disturbance of the sexual functions, or of some portion of the nervous system, is functional in its nature, and reflex in origin. Dr. Johnson is of the opinion that the paralysis of the adductors can be produced by any affection which creates a disturbance of the pneumogastrics, and which by reflex action interferes with the proper functions of the spinal accessory nerve.

Symptoms.—Impairment of the voice, or aphonia, is the only subjective symptom. As a rule only the voluntary exercise of the adductors is impaired; the reflex or involuntary movements, especially those of a forcible character, are not generally lost. Coughing and sneezing may be accompanied with the usual sound, while no sound is emitted when the patient attempts to speak or laugh. Hysterical or nervous aphonia is often associated with functional paralysis of the lips and muscles of speech, the lips and tongue remaining motionless on attempted phonation. This condition is described by Solis Cohen as *Apsithyria.*

Laryngoscopic examination reveals the vocal bands in a state of extreme adduction—the glottis is "wide open." On attempted phonation the vocal bands remain immobile, or they may approach each other very slightly and then quickly recede to their former position. The mucous membrane is generally anæmic, though in catarrhal cases the larynx may be found hyperæmic.

The **diagnosis** is easy if a careful examination is made to discover that the non-approximation of the vocal bands is not due to morbid growths, cicatricial tissue, tumefaction of the interarytenoid folds, or disease affecting the articulation of the arytenoids.

Prognosis.—As a rule the prognosis is favorable under suitable treatment.

The **treatment** of this affection must be general as well as local. Attention should be given to the correction of anæmia, uterine ailments, gastric irritation, and catarrhal laryngitis. Hysterical aphonia may often be cured by shock, and cold affusions to the front of the neck, followed by friction or massage, are often beneficial. Hypnotism has frequently proven useful in the treatment of functional nervous affections Stimulating inhalations may be employed, either of Creosote, forty minims to water one ounce, or Liquor ammoniæ and water, equal parts, one teaspoonful to a pint of water at 110° Fahr. If an astringent effect is desired Nitrate of silver, sixty grains to the ounce, may be applied to the interior of the larynx by means of the laryngeal brush or cotton-wrapped applicator. Electricity is sometimes the only effective plan of treatment. The faradic current is recommended, the electrode being placed on either side of the larynx, or the current may be passed from the thyroid to the back of the neck. Endolaryngeal faradism is the best method, however, one pole being connected with a necklet placed around the patient's neck, the plate being applied over the thyroid cartilage, and the other pole to be placed on the arytenoid cartilages or vocal bands. Electricity should not be used if the laryngeal mucous membrane is congested, and too strong a current must not be employed.

UNILATERAL PARALYSIS OF THE ADDUCTOR OF ONE VOCAL BAND.

Paralysis of one adductor alone may result from cerebral disease, or pressure on the pneumogastric or recurrent nerve by cancer of the œsophagus, aneurism of the arch of the aorta (subclavian), or goitre; or it may be due to cold, muscular strain, chronic toxæmia (lead or arsenic), and may occur as a sequel to diphtheria, syphilis, small-pox, and phthisis.

Symptoms.—One of the earliest symptoms is alteration of the voice, which is weak and hoarse, or possibly lost—this is especially manifested in the acts of coughing, sneezing, or laughing. The affection is frequently associated with slight dysphagia.

Diagnosis.—Upon examination one or the other vocal band will be seen lying stationary in extreme *ab*duction, showing a concave margin, and on attempted phonation the unaffected band is adducted as far as it can be toward the immovable band, the healthy and over-adducted arytenoid coming in front of the other. The surface of the affected vocal band may appear normal, but the mucous membrane is often congested. Any impairment of motion of one of the crico-arytenoid articulations might give rise to doubt, but the swelling or other evidence of structural change will serve to distinguish the condition.

Prognosis.—When the condition is due to cerebral causes or to pressure by growths, the prognosis is serious.

Treatment. — In syphilitic and toxæmic cases, endolaryngeal faradization is usually the most effective remedy. Sometimes patients recover spontaneously, or by the use of simple stimulant inhalations.

BILATERAL PARALYSIS OF THE ABDUCTORS OF THE VOCAL BANDS.

The vocal bands are abducted by the posterior crico-arytenoidei, which are respiratory muscles; they originate from the posterior surface of the cricoid cartilage, near the median line, their fibres running upward and outward to be inserted into the external angles of the arytenoid cartilages. During inspiration the contraction of these muscles causes the arytenoid cartilages to rotate upon their articulations, so that their anterior extremities are carried outward and the vocal bands are stretched and separated from each other. On expiration the crico-arytenoidei postici are relaxed, and the elasticity of the vocal bands restores them to their former position. The action of these muscles is dependent upon the influence of the pneumogastric nerve and its inferior laryngeal branch.

Bilateral abductor paralysis is rare. It is usually caused by some degenerative change taking place in the nerve-centres—tumors at the base of the brain, bulbar paralysis, locomotor ataxia. It may be due to pressure upon the recurrent laryngeal nerves, either by any new growth, bronchocele, aneurism, or goitre. The disease may be due to syphilis—to a gummatous deposit in the muscles—or it may result from diphtheria, typhoid fever, and the exanthemata.

Symptoms.—The voice is not much affected, but it may be weak or slightly hoarse. The chief symptom is inspiratory dyspnœa, which is especially great on exertion; during sleep the stridor is loud; expiration is not affected.

On laryngoscopic examination the vocal bands are seen in close proximity to each other, being retained in the median position by the *ad*ductors, the approximation being most marked on inspiration, a small separation taking place on expiration. The normal order of the movements of the vocal bands is therefore changed, hence the inspiratory stridor and dyspnœa.

Diagnosis.—Careful examination will render the diagnosis easy. This affection can be differentiated from spasm of the glottis; in the latter the tension of the vocal bands is more or less inconstant, the inspiratory dyspnœa is temporary, being diminished or absent during sleep. In paralysis the vocal bands are immobile, the inspiratory dyspnœa is more or less constant, being more marked during sleep than when awake.

The **prognosis** is unfavorable in such cases as are due to central lesion or destructive growths. Intubation or tracheotomy must be performed to prevent a fatal result, which is liable to occur at any time. The results of treatment are favorable in cases of catarrhal, syphilitic, or hysterical origin. The affected muscles undergo atrophy after the lesion has existed for several months, so that restoration of function is then an impossibility.

Treatment.—Suitable remedies should be employed in all cases where the cause is possible of removal—as in catarrhal conditions, the syphilitic variety, the hysterical form, or when pressure results from enlarged glands or goitre. Faradization and galvanism, used alternately, has proven beneficial.

Causticum.—Lack of co-ordination of vocal bands. Muscles of larynx do not perform their function, and there is inability to speak a loud word. Voice ends in a squeak when attempting to produce a high note.

Carbo vegetabilis.—Aphonia from relaxation of vocal bands. Deep voice, failing if exerted; no pain.

Hyoscyamus.—Aphonia from fright. Weakness and nervous agitation are very pronounced.

Ignatia. — Hysterical aphonia. Nervous spasms of the glottis. This remedy is characterized by hyperæsthesia of all the senses, and a tendency to spasms.

Pulsatilla.—Nervous aphonia; it returns at every emotion.

UNILATERAL PARALYSIS OF THE ABDUCTOR OF ONE VOCAL BAND.

This form of paralysis may be occasioned by a lesion of the nerve-centres, but more often it is due to peripheral causes—from pressure on one pneumogastric or one recurrent nerve.

Gout, rheumatism, diphtheria, lead-poisoning, typhoid fever, and the exanthemata have all been known to cause it.

Symptoms.—Inspiratory stridor and dyspnœa are characteristic symptoms, but they are not so marked as when both vocal bands are affected. The voice is somewhat impaired, but is seldom aphonic. An incidental congestion of the mucous membrane will cause an aggravation of the vocal and respiratory symptoms.

Diagnosis.—With the laryngeal mirror the immobility of the affected vocal band can readily be determined. It is usually congested, and on inspiration it retains a fixed position near the median line.

The **prognosis** must be guarded, the restoration of function being dependent upon the cause and duration of the paralysis. Cases consequent on simple inflammation usually terminate favorably.

Treatment.—When the paralysis is due to affections which are amenable to remedies, they should be managed in conformity with their special requirements. Faradism and galvanism may be useful in certain cases; in others, tracheotomy may be required.

PARALYSIS OF THE ARYTENOID MUSCLE.

(CENTRAL ADDUCTOR OF THE VOCAL BANDS.)

The action of the Arytenoideus muscle is to approximate the arytenoid cartilages, and then close the opening of the glottis, especially at its back part. This muscle, which is the central adductor, may be paralyzed in conjunction with the thyro-arytenoidei (lateral adductors), or may be affected alone.

Catarrhal laryngitis, diphtheria, and hysteria have been designated as the causes of the affection. The paralysis is always bilateral, and the voice becomes seriously affected or is lost.

Upon laryngoscopic examination, because of the imperfect approximation of the arytenoids, a triangular opening will be seen betweeen the vocal processes on attempted phonation, whilst the anterior three-quarters of the vocal bands will be thoroughly approximated.

Prognosis.—In recent cases the prognosis is favorable; when of long standing there is little hope of improvement.

Treatment.—Stimulating inhalations and astringent applications should be employed for the relief of catarrhal inflammation; faradism may be applied to the interarytenoid fold by means of the intralaryngeal electrode.

NON-MALIGNANT NEOPLASMS OF THE LARYNX.

There are several varieties of benign tumors of the larynx; of these papillomata constitute about seventy-five per cent., and fibromata about five per cent., of the whole number encountered. Cystic growths are not so frequent. Lipomata (fatty tumors), myxomata (true mucous growths), angeiomata (vascular tumors), adenomata (glandular tumors), ecchondroses (cartilaginous tumors), are all very rarely met with in the larynx.

Opinions differ as to the causes of benign growths in the larynx, but it is probable that chronic inflammation of a persistent character but low degree is the condition most favorable to their development.

PAPILLOMATA may be developed at any age—may even be congenital—but they are most frequently found between the ages of twenty and fifty years. Males are affected more frequently than females. Papillomata differ greatly in dimensions; the majority of them vary in size from a millet seed to a mulberry. They are most commonly situated on the upper surface of the anterior half of the vocal bands; when they grow from the under surface of the vocal bands it is somewhat difficult to estimate their size. Growths in the posterior commissure are seldom seen in a patient not tainted with syphilis or tuberculosis. Papillomata may be single or multiple, they may be rounded or elongated, pedunculated or sessile, of a grape-like or warty appearance, or may sometimes closely resemble a raspberry.

Their color may be dull white or whitish-gray, when their component parts are largely of fatty tissue; when of a reddish color they are more richly supplied with blood-vessels. Papillomata grow rapidly, and show a greater disposition to recurrence than other benign growths.

Papillomata, tumors of villous structure, are composed of connective tissue, more or less abundantly supplied with blood-vessels, and are covered by epithelium.

FIBROMATA generally originate from the upper surface of the anterior half of the vocal bands, but may occur in any part of the larynx. When small they are sessile, but they occasionally become pedunculated with increase of size. They are somewhat rounded or oval in shape, pale pink or bright red in color, and usually have a smooth but sometimes a rough, or even lobulated, surface. They grow very slowly, are almost always single, and in bulk they vary from the size of a pea to that of large nuts.

The hard fibroma consists of bundles of white fibres diverging and interlacing in various directions, with scanty development of blood-vessels, covered by several epithelial layers. The soft fibroma (fibro-cellular tumor) consists of fibro-cellular tissue, contains a small amount of serum-like fluid, and is abundantly supplied with blood-vessels.

After removal of fibromas there is no tendency to recurrence.

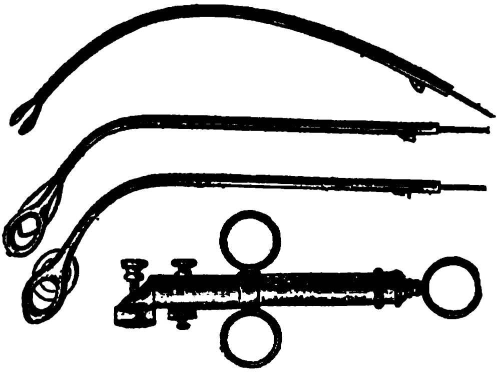
CYSTOMATA or mucoceles originate in the gland-substance, and occur most frequently on the lingual surface of the epiglottis and the ventricle of the larynx. They are globular, smooth, semi-translucent, covered with reddish mucous membrane, and are surrounded by a hyperæmic area. They belong to the class of retention cysts.

The **symptoms** will vary according to the size and situation of the neoplasm. If the growth is located on the edge of a vocal band it will cause more disturbance than when situated on its upper surface or below the vocal band. A pedunculated growth causes less difficulty than one which is sessile, and, obviously, a small growth less than a large one. The earliest symptom is an alteration of the voice, which will vary from a slight huskiness to absolute aphonia. When the growths are multiple or large, respiration is interfered with and asphyxia may suddenly occur unless prompt relief is at hand. Cough and laryngeal spasm are not uncommon if the growth is of a character as to vibrate in the breath current. If the growth hinders the vibrations of the edges of the vocal bands it causes dysphonia; aphonia is due to mechanical interference with the approximation of the vocal bands.

Diagnosis.—The three varieties of benign growths described present special features, and can readily be recognized by laryngoscopic inspection, which furnishes the best means of diagnosis. The papilloid formations which appear in phthisis and syphilis should be carefully discriminated.

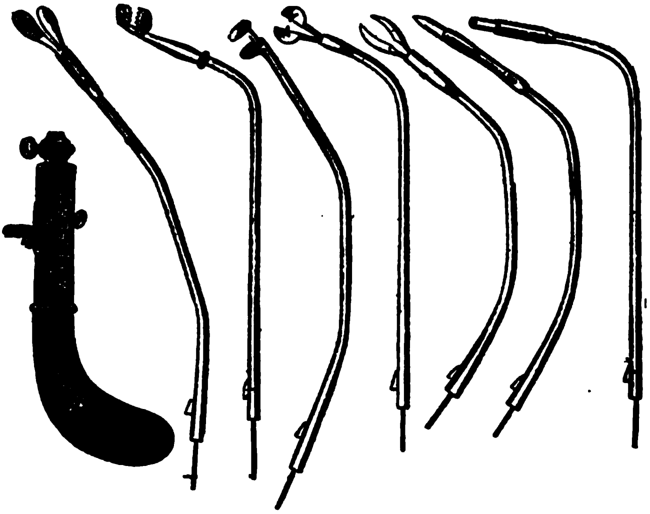
Prognosis.—Some benign growths occasionally undergo absorption; some remain quiescent for years; but the greater number enlarge and compromise life as well as function. The prognosis is generally good in non-malignant growths submitted to proper surgical treatment.

Treatment.—When operative procedure is necessary the choice of operation depends on the nature and situation of the growth and the emergencies of the case. When practicable, the removal by snare (Stoerck's) is the safest method. Removal by evulsion is effected by means of forceps, opening either laterally or in the antero-posterior direction. If the growth can not be



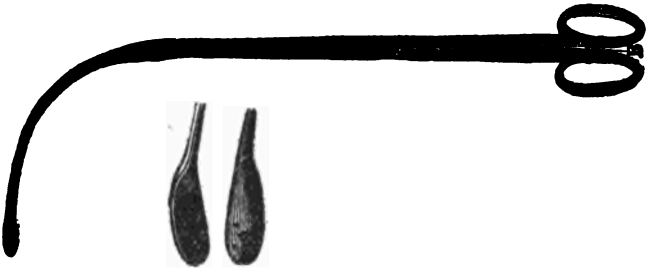
Stoerck's Guillotine and Tube Forceps.

removed in this manner, either piecemeal or in its entirety, crushing it near the base will often cause it to atrophy.



Schroetter's Extirpation Instruments.

If the growth be large and threaten suffocation, and the patient's throat is too irritable to tolerate manipulation without danger of inducing spasm of the glottis, tracheotomy should be performed before the removal of the tumor is attempted.



Fauvel's Forceps.

The use of galvano-cautery is dangerous except when employed by one who is expert in laryngeal manipulations.

Small growths may be destroyed by chromic acid ; this should always be done by means of a guarded applicator.

In all cases, before operating, the pharynx and larynx should be rendered anæsthetic by the application of a ten per cent. solution of cocaine.

Extralaryngeal operations should only be adopted when the growth is inaccessible from above and when life is in danger from suffocation.

Consult **Causticum, Kali bichromicum, Sanguinaria, Thuja.**

MALIGNANT NEOPLASMS OF THE LARYNX.

Malignant growths of the larynx are far less common than benign ones. They comprise carcinoma and sarcoma. Epithelioma, or squamous-celled carcinoma, is the commonest variety, the encephaloid, or large spheroidal-celled carcinoma, being much less frequent. Sarcoma of the larynx is comparatively rarely met with.

Many theories have been advanced concerning the cause of carcinoma and sarcoma, but their etiology is still involved in doubt. Malignant growths are attributed to the abuse of alcoholic liquors and tobacco, especially in those who use the voice excessively, to chronic laryngitis, and to traumatism, as the initial exciting causes. All influences which predispose or excite local irritation in the larynx play a very important part in the etiology of the disease. A predisposition to the malady seems to exist in some families.

Epithelioma is the form of cancer most common in the larynx, where it may occur primarily, or by extension from the pharynx, œsophagus, or tongue. The growth is generally unilateral, and is nearly always limited to the left side. Epithelioma is a disease of middle and advanced life, being rarely observed before the fortieth year, and is developed most frequently between the fiftieth and sixtieth years of life. It occurs more often in men than in women.

When carcinoma has its origin upon the epiglottis, the ary-epiglottic folds, or the arytenoid cartilages, it is termed *extrinsic.* When the tumor primarily attacks the ventricular bands, the ventricle and the vocal bands, it is called *intrinsic.*—(Krishaber.)

Though the voice is never entirely lost, hoarseness is the first noteworthy symptom; in the early stage it is often due to implication of the inferior laryngeal nerve; in the ulcerative period it is caused by the progress of the disease and consequent structural changes. In *intrinsic* cancer there is a gradually increasing disturbance of respiration. Dyspnœa is frequently occasioned by slight physical exertion, and depends, to a great degree, upon the extent of subglottic œdema and glottic stenosis.

In *extrinsic* cancer deglutition is soon affected, causing either dysphagia or odynphagia. Copious salivation is often a prominent symptom. Owing to dysphagia the saliva flows from the mouth day and night. Degeneration and ulceration mark the beginning of the second stage of the disease. As soon as ulceration begins, especially in the *extrinsic* form, the disease extends to the neighboring lymphatics, and through them the general system becomes profoundly involved.

Pain, which is more or less constant, is of a dull character in the earlier stages; in the ulcerative period the pain is sharp, cutting, and excruciating, and is reflected from the larynx to the ears, orbit, and forehead.

The laryngoscopic appearance of the parts in the early stage of the disease does not differ from that of ordinary catarrhal hyperæmia. Subsequently the tumor, which is of a reddish-brown color, with smooth broad base, steadily increases in size until just before it ulcerates. The surrounding mucous membrane is of a deep red color, and becomes studded with vegetations as the disease advances. These new growths, by ulcerating in successive course, rapidly increase the original loss of substance.

In the encephaloid variety the vegetations spring from the *surface* of the ulcer, and do not attack the adjacent mucous membrane, the loss of tissue taking place by the spreading of the primary ulcer.

The sensation of irritation and swelling in the larynx may occasion expulsive efforts to cough. In advanced cases the expectoration is purulent, mixed with blood and fragmentary portions of the cancerous mass.

The spindle-celled sarcomas vary much in density, but are always much firmer than the round-celled form. A certain amount of fibrous tissue is found in these tumors, and they bear a close resemblance to the fibroma. Sarcomas grow more quickly than fibrous tumors, are attended by more pain, they are usually single, and occur chiefly about middle life.

In the round-celled sarcoma the cells may be very small or large, and are surrounded by an intercellular substance which is very soft or semi-fluid. This variety grows rapidly, and extends by invading the adjacent tissues. The round-cell sarcoma bears a general resemblance to the encephaloid variety of cancer.

Sarcomata may commence in the ary-epiglottic fold, the epiglottis, the vocal band, or the ventricular band. Sarcomas are generally round, sessile, and smooth, and in consistence may be hard or soft. The softer and more vascular the species of sarcoma the more rapidly will it be developed and be disseminated.

Sarcomata are to be distinguished from cancers by the difference in their microscopical characters, by their non-invasion of tissues other than the areolar, and by not infecting the lymphatic glands. They grow rapidly, and often to a large size.

Diagnosis.—At the outset, previous to ulceration, cancer may be confounded with hypertrophic inflammation of the larynx, gummatous tumors, and papilloma of the larynx. Subsequent to ulceration cancer may be mistaken for tuberculous and syphilitic ulcers. If the microscope can not relieve from doubt, careful attention to the minutiæ in the clinical history and laryngoscopic appearances will often serve to justify a positive opinion.

The **prognosis** is invariably bad, life terminating by either asthenia, asphyxia, or hemorrhage. Excision of epithelioma, except in the earliest stage, is invariably followed by recurrence. The average duration of life of patients suffering from carcinoma of the larynx, without surgical interference, is about eighteen months.

Surgical measures include tracheotomy, endolaryngeal operations, and thyrotomy, with partial or complete laryngectomy. Tracheotomy should be performed on the first appearance of respiratory disturbance. This operation gives rest to the affected organ, permits the patient to breathe, extends life, and renders endolaryngeal treatment much easier of accomplishment. Many successful results are recorded of the removal of malignant growths *per vias naturales.* The results are best when the low operation is made, whether or no there is a tendency for the tumor to disseminate. Tracheotomy should always be done several days before thyrotomy or laryngectomy are attempted. By this means the patient will become accustomed to the tracheotomy tube, and the passage of blood into the trachea can be avoided.

Thyrotomy with partial laryngectomy can only be successful when made at an early period of the disease, when it is limited to one side, and when the lymphatics are not involved.

Thyrotomy with complete laryngectomy is the only operation when both sides of the larynx are involved. This operation is attended with many dangers, and the results as to life extension are unfavorable.

For details concerning the method of performing these operations the reader is referred to works on surgery.

Antiseptic and detergent sprays are indispensable when ulceration has occurred. The following solutions, in water, are recommended: Acidi carbolici, gr. iij ad. ℥j; Potassæ permang., gr. v ad. ℥j; Listerine, ʒj–ʒij ad. ℥j; Acidi borici, gr. x ad. ℥j.

Applications of cocaine (ten per cent.), or the insufflation of morphine (¼ to ½ grain, mixed with starch) before taking food will relieve pain and render deglutition less difficult.

When deglutition becomes painful, semi-solid or peptonized food should be prescribed, or the patient must be fed either by means of an œsophageal tube or by rectal enemata.

Undoubted cures of epithelioma have been reported to be made by the internal administration of **Arsenicum album**, **Clematis**, **Conium**, **Hydrastis**, **Kreosotum**, and other remedies. Though certain cases of cancer can not be cured, much may be done to prolong life and to render the patient comparatively easy during the progress of this painful disease. Consult also **Arsenicum iodatum**, **Belladonna**, **Iodum**, **Lachesis**, **Morphinum**, **Phytolacca**, **Sanguinaria**, **Thuja**.

FOREIGN BODIES IN THE LARYNX.

An enumeration of the varied assortment of foreign bodies which have found ingress into the respiratory tract would fail to fulfil any useful purpose. The greater number of foreign bodies enter the air-passages through the mouth during forcible or inopportune respiratory effort. Not infrequently foreign bodies which have been held in the mouth may drop into the larynx during sleep. Occasionally they enter the trachea from without, as in gunshot wounds, or through fistulous openings from the œsophagus as the result of ulceration or abscess.

The situation of foreign bodies in the larynx, with reference to the symptoms and treatment, is of great importance. A foreign body may be deposited just behind the epiglottis, in the ventricle, lay across the glottis, between the vocal bands, or it may descend into the trachea or bronchus. Though a body which is lodged in the ventricles may be tolerated for a time, one which is situated in the opening of the glottis causes immediate, and at times dreadful, symptoms. Large pieces of food, or angular bodies, generally become fixed in the opening of the glottis; flat bodies, such as buttons or coins, if not large or angular, usually occupy the ventricles of the larynx; needles, pins, and other sharp-pointed bodies, most frequently become infixed at the epiglottis, the ary-epiglottic folds, or the supra-glottic portion of the larynx. Small, round, and heavy bodies generally drop into the lower respiratory tract.

Foreign bodies in the larynx or trachea may be fixed or movable; their mobility, however, is usually of short duration, as they become fixed at one point, either from the irritation and swelling which they produce, or from modifications of their own substance. Foreign bodies change their position more frequently in the trachea than in the larynx. In the trachea they are kept movable by the column of air, ascending during expiration and descending during inspiration. In the larynx their position is only changed by a violent respiratory act, or by ulceration, when they are generally ejected. A movable body in the larynx may change its position and become adapted to the opening of the glottis, thus causing spasm of the larynx, or obstruction and instant death by suffocation. When in the trachea they may be projected into the larynx and cause suffocation, or they may be driven into the bronchus, with like result.

The tolerance of the larynx to foreign bodies is never absolute, and seldom lasts long, because after a time the sensibility of the organ renders it liable to be inflamed. Sharp-pointed bodies, or those with irregular edges, are liable to become fixed into the mucous membrane, which swells up around them, their further penetration being aided by the spasmodic contraction of the muscles. Under such conditions abscesses are likely to result, which often lead to a fatal issue. The majority of foreign substances are spontaneously expelled in the midst of a paroxysm of cough. In these cases the expulsion is primary—*i. e.*, they are ejected soon after their intrusion into the larynx. In other cases a foreign body may, after an uncertain period of relative tolerance, become disengaged during the paroxysm of cough or through the process of ulceration.

As soon as a foreign body enters the larynx it produces a series of acute and violent symptoms. Pain is one of the most constant symptoms. There is also an almost incessant, distressing, convulsive cough, dyspnœa, and indications of asphyxia, which disappear unless the offending substance is so large as to completely occlude the respiratory tract. Hemorrhage may result from the penetration of blood-vessels by sharp-pointed bodies. Obstinate and dangerous hemorrhage may result from the presence of leeches in the larynx, which enter in drinking water from pools or brooks. The instantaneous cyanosis and strangulation are due either to mechanical obstruction, or to spasm of the laryngeal muscles, induced by direct irritation from the foreign body. The secondary symptoms of foreign bodies in the air-passages are chiefly inflammatory; tracheitis and bronchitis are inevitable, and localized pneumonia is not infrequent.

The **diagnosis** may be determined by direct palpation, laryngoscopic inspection, and auscultation. Foreign substances in the larynx can at times be detected with the finger when inspection with the laryngoscope is impracticable, or when the foreign body is so embedded that it can not be seen. A laryngoscopic inspection should be made in every case; in most cases it will be very difficult, because of the irritation and spasm, but with the aid of cocaine or chloroform it can usually be accomplished. Auscultation is of great aid to diagnosis in detecting the location of foreign bodies in the lower respiratory tract. The history of the accident, the initial paroxysm, and the sudden development of the symptoms are important aids to the diagnosis.

Treatment.—In cases of imminent asphyxia the chief indication is to re-establish respiration, and this is best done by opening the trachea below the cricoid cartilage. When fatal asphyxia is not threatened recourse has been had to consecutive changes in position—the horizontal posture, to lateral and abdominal decubitus, and to suspension with the head downward, the patient meanwhile being violently shaken, or slapped on the back. This treatment favors displacement, especially if the foreign body is smooth or weighty. When the foreign body is fixed in the larynx extraction through the fauces should be attempted by means of forceps or hooks, with the aid of the laryngoscopic mirror. The removal of sub-glottic bodies (especially when they are rough or angular) through the natural passages is sometimes injudicious, because of the liability to lacerate the larynx and thus cause permanent impairment of the voice. In some cases such bodies have been crushed and then removed; if this plan is not practicable, recourse must be had to laryngotomy or thyrotomy. Tracheotomy is indicated when the foreign body is in the trachea or a bronchus, and in children it is to be preferred to laryngotomy because of the small size of the larynx.

FORMULÆ.

In addition to the methods of treatment suggested in various portions of the text, the following formulæ for remedies have been found to possess definite therapeutic action. The principles and methods which regulate the application of those formulæ which are numbered are contained in the body of the work.

Detergent preparations may be used with either the spray-tube or post-nasal syringe. All nasal douches should be used at a temperature of about 98° Fahr.

1. ℞.	Sodii bicarbonas,	
	Sodii boras, of each,	gr. viij–xx
	Glycerinum,	ʒj
	Aqua tepida, ad.	℥j
Misce.		

2. ℞.	Sodii chloridum,	ʒxviij
	Camphora,	gr. iij
	Acidum carbolicum,	M viij
	Eucalyptol (Sander & Sons),	M xiij
	Aqua,	Oij
Misce et filtra.		Dr. C. E. Teets.

The Camphor and Eucalyptol should first be dissolved, separately, in two drachms of Alcohol. When properly prepared and filtered it will be a transparent straw-colored solution, and will not deteriorate by age. It is an excellent detergent and non-irritating preparation. Of this mixture use one part in six times as much tepid water for each douche.

3. ℞.	Sodii bicarbonas,	gr. xxx
	Sodii boras,	gr. xxx
	Acidum carbolicum,	M viij
	Glycerinum,	ʒjss
	Aqua, ad.	℥ij
Misce.		

Detergent and antiseptic. Useful in simple chronic and hypertrophic rhinitis. Of this mixture one tablespoonful may be added to two tablespoonsful of tepid water.

4. ℞.	Menthol,	gr. v
	Benzoinol,	℥j
Misce.		

Useful in hyperæmia of the turbinated bodies, and controls the frequent erections of the mucous membrane. In painful inflammatory affections the Benzoinol may be substituted by Calenduol, in the same relative proportions.

5. ℞.	Menthol,	gr. ijss
	Camphora,	gr. ijss
	Benzoinol,	℥j
Misce.		

Useful in intumescent rhinitis.

6. ℞.	Acidum tannicum,	gr. iij
	Glycerinum,	ʒiv
	Aqua,	ʒiv
Misce.		

Useful in chronic rhinitis. As the rhinal mucous membrane is very intolerant of all astringents, they should be employed with caution in the nasal cavity.

7. ℞.	Iodum,	gr. ij
	Acidum carbolicum,	gr. ij
	Benzoinol,	℥j
Misce.		

8. ℞.	Ferripyrine,	gr. x
	Aqua dest.,	ʒij
	Fl. extr. Geranium maculatum,	℥j
Misce.		

The Ferripyrine should first be dissolved in water, then the fluid extract of Geranium maculatum may be added. This preparation forms an ideal styptic, and not only arrests rebellious nasal hemorrhage but checks the bleeding after tonsilotomy.—Dr. C. E. TEETS.

Iodo-Glycerine Solution.

9. ℞.	Tinct. iodi,	gr. x
	Potassii iodidi,	gr. xx
	Glycerinum,	℥j

Misce.

Useful in naso-pharyngitis and chronic pharyngitis.

10. ℞.	Tinct. iodi,	
	Potassii iodidi, of each,	gr. xc.
	Glycerinum,	
	Aqua, of each,	℥iv

Misce. M. RUAULT.

Before using this solution the surface should be anæsthetized with cocaine. A superficial eschar forms on the surface treated, which separates after a few days. The applications may be repeated every eight or ten days.

Use.—In granular pharyngitis, lacunar tonsillitis, pharyngomycosis.

DR. C. E. SAJOUS :—

11. ℞.	Sodii boras,	
	Ammonii chloridum, of each	℈j
	Potassii permanganas,	gr. x

To be dissolved in one pint of water at 100° Fahr.

Use.—In atrophic rhinitis and syphilitic pharyngitis.

12. **Alumnol**, in five or ten per cent. solution with distilled water is a solution of high value for chronic pharyngitis, especially of the follicular variety. It may be used in atomizer, spray-tube, or with cotton-wrapped applicator.

℞.	Cocaine,	gr. x
	Antipyrine,	gr. x
	Tinct. Belladonna,	M xv
	Aqua dest.,	℥j

Misce.

Use.—In acute rhinitis, when there is much swelling of the middle turbinal, with pain and throbbing at the root of the nose. If judiciously employed it often prevents the extension of the inflammation to the accessory sinuses.—DR. C. E. TEETS.

℞. Boric acid,	℥j
Tinct. Plantago,	ʒij
Ichthyol,	M xxx

Misce. DR. C. E. TEETS.

Indicated in atrophic rhinitis; use in insufflator twice daily.

℞. Eucalyptol (Sander & Sons),	M xxx
Menthol,	gr. v
Aristol,	gr. xx
Benzoinol vel Albolene,	℥j

Misce.

Indicated in hypertrophic rhinitis, with watery discharge and frequent sneezing.

Thujaole, ten or twenty per cent. solution as prepared by C. F. Lord, of this city, is especially useful in hypertrophy of the erectile tissue, and when there is an offensive purulent discharge, sometimes accompanied with ulceration and scabs in the nostrils. A five per cent. solution has given satisfactory results in dry coryza.—Dr. C. E. TEETS.

Camphora carbolisata, or **Camphorated Phenol,** is an excellent antiseptic, and topical applications quickly modify the inflammatory conditions of simple and lacunar tonsillitis.

Tinctura Benzoini compositæ, one teaspoonful in a pint of water (140° Fahr.), and used as an inhalation for five or ten minutes, is a valuable sedative in acute inflammations of the pharynx and larynx.

Suprarenal Gland.—An aqueous solution of the desiccated extract of the suprarenal gland of the sheep is a powerful local vaso-constrictor agent, and has been found to be especially efficacious in controlling hemorrhage, when locally applied, previous to operations in the nose, particularly upon the septum. While useful in acute congestions, it is also serviceable as a palliative in certain chronic conditions where there is a proneness to the development of redundant tissue.

As watery solutions of the desiccated gland have a tendency to rapid decomposition and are then unfit for use, it is better to prepare the solution as required.

Five grains of the desiccated extract of the suprarenal gland should be dissolved in two drachms of water which has been boiled, and after thorough shaking should be filtered. It is then ready for use, to be applied when the local anæsthesia is complete.

Secondary hemorrhage has occurred in a number of cases after its use; it is prudent, therefore, to tampon the nostril, after operations, for about twenty-four hours.

PART II.

DISEASES OF THE EAR.

DISEASES OF THE EAR.

GENERAL OBSERVATION ON THE SENSE OF HEARING.

HEARING is the faculty of the perception of sound. The sense of hearing is next in importance to that of sight. This faculty resides in the brain and depends upon the proper transmission of sound vibrations through the external canal, and the chain of three bones in the tympanum or middle ear, to the labyrinth or internal ear, where they are received by the terminal organs of the auditory nerve.

Sound is a form of wave motion differing in amplitude and velocity, according to the density of the medium, and easily conducted through the air.

Sound waves passing from air to a more solid medium are in part reflected, and lose some amplitude of molecular movement, but where a membrane, free to vibrate, separates a rarer from a denser medium very little activity is lost.

Any defect of these several factors, or in their arrangement, diminishes the quality of hearing.

The *impression of sound* may be produced upon the auditory nerves by certain forms of irritation without the intervention of the ear, and it may originate in the brain, as, for example, in dreams and hallucinal insanity.

Hearing, as it is generally understood, comprises a conception of the character of sound—its volume or intensity, pitch, timbre or quality; duration, direction, distance and variety.

THE EXTERNAL EAR.

ANATOMY OF THE AURICLE.

The *auricle* or pinna is that portion of the ear standing out from the side of the head in the direction generally upward and backward. Its frame is of reticular cartilage about two millimetres in thickness covered by perichondrium and irregularly concave on its anterior or inner surface.

The integumental covering is continuous with and differing but little from that of the face. On the concave surface it is more closely adherent to the perichondrium, the layer of areola tissue being very thin.

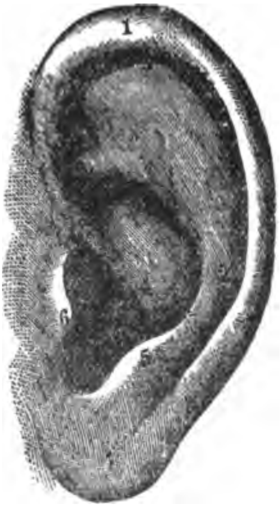


Fig. 1. The Auricle. 1, Helix; 2, anti-helix; 3, fossa helicis; 4, concha; 5, anti-tragus; 6, tragus; 7, lobe. (After Roosa.)

The dependent portion or lobule is made up of skin, fat and dense connective tissue.

Each ridge and depression has its name, but only those most important will be detailed here.

The outer rounded edge is the *helix*, and just within this and following its general direction another ridge receives the name *anti-helix*. That point projecting from the cheek over the meatus is the *tragus*. Opposite this and directly above the lobule is the *anti-tragus*. The *concha* is the rounded deep depression between these, with the *auditory meatus* leading from it. Large and numerous *sebaceous glands* are found in the integument of the concha. Many *large hairs* often grow from the tragus and about the meatus.

The *muscles* and *vessels* are unimportant practically.

Physiology.—Such authorities as Politzer and Burnett state that the auricle, especially the concha, materially assists in the reception of sound waves, while Darwin, Kupper and Roosa call it simply an appendage.

ANATOMY OF THE EXTERNAL AUDITORY CANAL.

The *external auditory canal* extends inward from the bottom of the concha to the membrana tympani, an average distance of twenty-four millimeters. A little more than one-third of the wall is cartilaginous, continuous with that of the auricle.

A deficiency in this, above and posteriorly, is of membranous structure. The cartilaginous part is joined to the osseous portion by elastic connective tissue and the membranous portion is continuous with its lining membrane. The balance of the canal is through the petrous portion of the temporal bone. Through the cartilage the general direction of the canal is slightly upward and backward and in the bone downward and forward.

The inferior and anterior walls are longer by 4 to 6 mm.

At the meatus the average canal has a diameter of 10 mm. and at the tympanum 9 mm. At a point just external to the tympanum the diameter is only about 6 mm. In children the canal is quite small. In adults its size varies greatly.

Usually there are two fissures transversely in the cartilaginous wall which are filled in with fibrous tissue and called the

Sartorian fissures. These and the membranous portions of the canal allow a certain straightening of the canal by drawing the pinna upward and backward.

The lining membrane of the canal is integument, continuous with that of the auricle. Over the bony portion this is thin and closely adherent to the periosteum, but much thicker where it covers the cartilage, and is richly supplied with hair follicles, sebaceous and cerumenous glands.

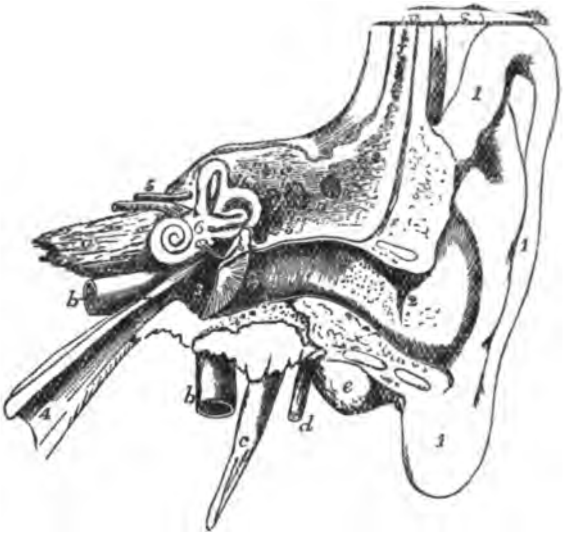


Fig. 2. Diagrammatic view from before of the parts composing the organ of hearing of the left side (after Arnold).

1, The pinna and lobule; 2 to 2', meatus externus; 2', membrana tympani; 3, cavity of the tympanum; above 3, the chain of small bones; 3', opening to the mastoid cells; 4, Eustachian tube; 5, meatus internus containing the facial (uppermost) and auditory nerves; 6, the vestibule of the labyrinth; *a*, apex of the petrous bone; *b*, internal carotid artery; *c*, styloid process; *d*, facial nerve issuing from the stylo-mastoid foramen; *e*, mastoid process; *f*, squamous part of the bone.

The *integument* of the canal is peculiar, in that it is produced and *grows from within outward*, thus tending to bring to the meatus the cerumen which accumulates. As having a bearing on diseased conditions it is well to note the location of the anatomical strucures about the canal.

The *parotid gland* is just below. Two plates of thin bone separate the canal from the brain above. Behind are the mastoid cells and the transverse sinus. Lack of bony development occasionally leaves but a membranous partition between the canal and these structures.

According to Politzer sound waves are reflected from the concha to the tragus and then twice more within the canal before reaching the tympanum.

MALFORMATION OF THE AURICLE AND CANAL.

The development of the auricle may be arrested or may be excessive, or the auricle may even be misplaced. Parts or even the whole of it may be double, or they may be lacking. The cartilage may be deficient above and the integument lopping over upon itself. Occasionally there will be but a thick bunch of convoluted cartilage or a mere tab with the meatus absent or reduced to a fistula.

Bad management of children often results in protruding auricles. The canal, middle ear and meatus usually share in congenital defects. There may be deficiencies in the bony, or cartilaginous walls, or the canal may be double, one good and the other blind. I have recently seen a case in which the auricle was perfect, with a short blind canal of which the patient claimed to be ignorant; and another which had been artifically produced to escape military duty in Russia.

Otoplasty for these defects is of limited usefulness, but any results are usually very gratifying to the patient.

Protruding auricles are easily repaired. Relief for *atresia* of the canal should only be undertaken when the secluding membrane is fairly thin and the ear trumpet and Eustachian catheter demonstrate the existence of a tympanum.

DISEASES OF THE AURICLE.

The auricle is liable to all the diseases observed in other portions of the body of similiar structure. Only those of peculiar interest will be mentioned here.

PERNIO; *Frost bite* may occur after very brief exposure to great cold and is an acute dermatitis. The redness, pain and swelling after getting the frost out of the tissues is considerable and in severe cases soon followed by the formation of large blebs filled with serum. There is an excellent popular method of applying snow or ice water to the part to avoid reaction. Following this a dressing of absorbent cotton saturated with glycerine gives the best results. Should a bleb break, leaving a granulating surface, it should be treated as a burn. Together with whatever may be demanded locally it is probable that a cure is more rapidly affected by using the indicated remedy internally. Among those commonly called for in this condition will be :—

Apis mallifica.—With œdema and sharp stinging pains.

Rhus toxicodendron.—Small vesicles, burning pain, formation of crusts, phlegmonous tendency.

Belladonna.—Smooth red and tense skin with sharp pains.

HORNY GROWTHS are occasionally seen, generally on the helix and due to cell proliferation or developed from a dermoid cyst. This can be extirpated with the knife.

SEBACEOUS CYSTS of the lobule occasionally attain large size and should be treated in the same way, being careful to remove the sac.

FIBROMA is also generally of the lobule and a result of ear-piercing, most common in negroes. They should be exercised early and the incisions should be made well over into healthy tissue.

HÆMATOMA OF THE AURICLE.

This is the so-called othæmatoma. It is a rare affection usually occurring in the concha and said to be idiopathic in the insane, but otherwise generally traumatic. It is an inflammation separating the perichondrium from the cartilage and rapidly forming till the concha or even the whole anterior surface of the auricle has a smooth convex surface. The contents is blood or sanguineous fluid. These tumors tend to a spontaneous opening and in the healing process considerable deformity often results.

Treatment.—Incise the tumor, evacuate its contents, curette if necessary, employ antiseptic solutions and apply pressure. Packing with iodoform gauze may be needed. Gentle massage administered after the inflammation subsides has prevented deformity even in severe cases.

EPITHELIOMA and LUPUS. Primary malignant neoplasms seldom occur in the auricle and when they do are more amenable than elsewhere to the rules of general surgery which should govern their treatment.

DISEASES OF THE CANAL.

The canal can have only those diseases which can develop in the tissues entering into its formation, and these may be divided into *circumscribed* or *diffuse*, *acute or chronic*, *primary* or *secondary*. *A polypus* which may occupy the canal, being a growth from the tympanic cavity, will be discussed under middle ear diseases. Before taking up the more inflammatory conditions it seems best to consider—

IMPACTED CERUMEN.

Normally the movements of the jaw and the outward growth of the epithelium of the canal cause the secretion of the cerumimous glands to approach the meatus where it is imperceptibly cleaned away.

Etiology.—Impaction occurs where there is a narrowed meatus obstructing this process; when there is hypersecretion of the glands due to a persistent congestion of the tissues. Such congestion may be idiopathic or caused by the mechanical irritation of a small foreign body, or the pernicious use of hairpins and ear swabs. If a small mass of cerumen collects it becomes the cause of further increased action of the glands lying about it. A foreign body is frequently the nucleus of the mass. As this process continues the secretion sometimes acquires a tough and tarry consistency irritating deeper portions of the canal which freely exfoliates its epithelium, while in the anterior portion it becomes matted with hairs.

In some cases we are warranted in believing that an interference with the nerve supply modifies the secretion. Often *the cause* is not to be found. As long as the tympanum is not pressed upon and there remains a small open space hearing may remain good and the patient be quite unconscious of the mass of wax in his ear.

Pathology.—The removed masses are often found to contain, besides wax, small foreign bodies, hairs, vegetable spores and epidermis. When a large amount of wax has formed, increased perspiration or water in the ears will cause the mass and its contained epithelium to soften and swell so as to close the canal and touch the drum membrane and so result in the *subjective symptoms* of deafness and noise which brings the patient to the aurist's attention.

It has been the author's experience that this class of cases are therefore most frequently seen in the spring and summer. Occasionally these masses of cerumen attain a large size and from irritation develop a desquamative dermatitis thus adding to itself more material. From pressure the membrana tympani may become congested and inflamed, resulting in a rupture and serious pathological changes in the middle ear. Pressure may also dilate the canal, especially in the deeper portions and along the posterior wall, till the mastoid process atrophies, losing much of its cancellated character.

Symptomatology.—In general it may be said that the symptoms correspond to the size and deep position of the mass, but exceptions are common. Often no symptoms occur till the mass is suddenly displaced, when there will be deafness, a feeling of fullness, "a stuffy" feeling and, perhaps, pain. More frequently there is some gradual loss of hearing, itching and slight tinnitus, or the noises may be loud and constant.

A distressing and infrequent symptom is a persistent spasmodic cough caused by irritation of the descending branch of the auriculo-pneumogastric nerve along the posterior wall and reaching the larynx through the superior laryngeal. Ocular inspection through the speculum is necessary for a diagnosis.

Treatment.—Where the plug does not quite fill the canal the opening is most frequently above or posterior, and inspection will generally show whether the mass be hard and deep or more or less soft and scanty, in which latter case it will usually be in the lower cartillaginous or osseous canal and is best removed by the blunt ring probe.

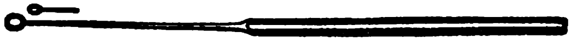


Fig. 3. Blunt ring curette.

When the mass is hard, deep and completely fills the canal or there is any doubt on these points, the safest and by far the best method of *removal is by the syringe*, using a warm solution of bichloride of mercury in the strength of 1-5000. The solution should be antiseptic, because in case there should be an old or recent perforation of the drum harm might otherwise be done. The stream should be small and at first slow and directed above and posteriorly. As a rule, the mass comes away in broken pieces or the water may pass through a small aperture and force out a solid cast of the deeper canal. The removal should be completed at one sitting, for otherwise serious inflammation may result from the swelling mass.

When the plug appears very hard and dry it may be softened by the instillation of a few drops of any bland oil, nightly for three days, but no other substance should be used. The syringe used may be the ordinary hard rubber variety, or preferably a metal one, twice the size, with a flange to protect the operator from the return current.

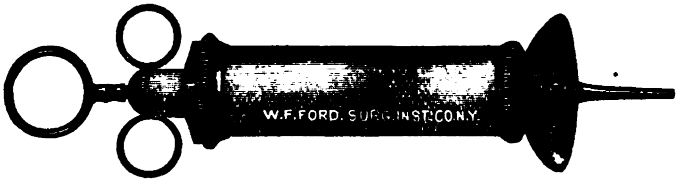


Fig. 4. Pomeroy's metal ear syringe.

A pus basin must be held against the neck to catch the returning water.

A syringe connected with the Allen pump has the merit of a steady, continuous stream and is excellent in hospital practice.

The canal should be left clean and wiped dry with cotton, a plug of which should remain in the meatus for twenty four hours.

Observation and treatment should be maintained till the canal is in a normal condition. The accumulation is liable to recur in the course of a few months. Very little can be done for this condition outside of homœopathic remedies which should be prescribed according to the patient's symptoms and the condition of the canal and tympanum as found after the wax has been removed. Patients with a tendency to excessive collection of wax should have it removed every two or three months. Other treatment than that they will generally not consider necessary.

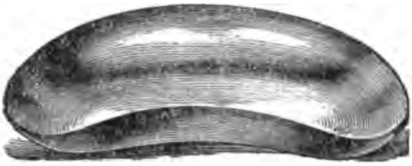


Fig. 5. Pus basin.

ACUTE CIRCUMSCRIBED EXTERNAL OTITIS.

FURUNCLE

Etiology.—The outer third of the canal, and especially just within the meatus, is the most common site of furuncle, but occasionally it is deeper. In many cases the cause cannot be ascertained.

A low condition of the general health, diabetes, anæmia and digestive disturbances are predisposing influences. Not infrequently a direct infection takes place by the entrance of microorganisms through a surface abraded by the meddlesome patient. Infectious material from a suppurating middle ear may also enter the glands at their meatus.

Symptomatology.—The symptoms in the order of their usual manifestation are a feeling of fullness, slight itching, tenderness on pressing the tragus, throbbing, and positive pain. In less than a day this may become unbearable and with it considerable swelling, even occlusion of the canal, in which case there will be tinnitus, or tinnitus may result from an extension of congestion to the tympanum. Some external tumefaction frequently appears according to the location of the furuncle and the pinna may be pushed forward. At the height of the symptoms no pressure can be borne upon the auricle and even movements of the jaw will be painful.

In strumous subjects the neighboring lymphatic glands frequently indurate but very seldom suppurate. The duration of furuncle is from two to four days, occasionally longer, and the symptoms subside rapidly following the escape of pus. More than one may be present at a time or several attacks follow at intervals. Night is the period of the greatest suffering, due to the recumbent position and absence of distracting influences. Hearing is impaired both by occlusion and congestion.

Treatment.—In the early stages an effort should be made to abort the suppuration, and for this many measures are advocated both local and internal.

An early incision is certainly the best of the local abortive methods. It is not necessary to wait for pus to form. If, by the cotton-tipped probe, a tender point in the outer third of the canal can be found, and the patient complains of throbbing, a deep incision should be made with a small sharp curved-bistoury, first having cleaned the canal with a 20 gr. sol. of boric acid in equal parts of alcohol and water. No swelling may be manifest at this stage, for the reason that the process is deeply seated. Such an opening relieves the tension and induces considerable bleeding. The very severe suffering momentarily inflicted is justified by the results. For *local anæsthesia* cocaine is useless if not subcutaneously injected and that is as painful as the incision. Magendie's solution has but slight effect.

The pain is somewhat lessened by the use of the freezing spray of ether or chloride of ethyl, which is itself not free from pain. Ordinarily suppuration is prevented, relief is immediate and repair begins at once. Some slight discharge may keep up for a few days and it should be antiseptically cleaned away with the cotton carrier using peroxide of hydrogen, or 20 gr. sol. boric acid. Lack of attention to this detail may be the cause of new centers of infection. Incision properly made, with subsequent antiseptic treatment after pus formation, reduces the tumefaction and shortens the whole disease.

Blood-letting in the early stage by the natural or artificial leech is highly extolled, but is inferior to early incision; and after pus has formed, in the anterior wall with tumefaction anterior to the tragus, or when in the posterior wall with a similar condition over the mastoid, it is useless.

For the relief of pain it is common practice to use all sorts of fluids dropped into the canal. When used hot there is some temporary relief, but they injure the drum, macerate the epidermis, and assist in the occlusion of the canal. In this latter condition they may be the moving cause of a middle ear disease.

Aside from the carrying of heat these solutions of oil and laudanum, morphine, cocaine, atropine, lead, dilute carbolic acid, etc., can act but slightly except through an abraded epidermis.

They should never be poured or dropped into the ear, but inserted into the meatus on a pledget of cotton.

In this way any of the above drugs can be used and have considerable local action if the epidermis has exfoliated or been abraded. Fl. ex. plantago maj. and warm water, equal parts, acts better than any of the above except cocaine. A twenty grain solution of menthol in a bland oil also acts well.

Pain at any stage is much relieved by heat. Dry heat is preferred in the shape of a bag of hot salt wrapped in flannel, the common rubber hot water bag, or the light Japanese pocket stove.

Moist heat like poultices in or around the ear or the heart of a boiled onion placed in the meatus certainly relieve, but are ob-objectionable because they injure the canal and favor further furunculous development.

Continuous irrigation with warm water from a fountain syringe is in the same category. Cold applied by the Leiter coil or the ice bag is unsatisfactory in practice. The patient's general condition should be looked after and his diet regulated.

REMEDIES.—**Aconite** 2x. would seem to be indicated in the fever, but I have seen little benefit from it in acute local inflammation.

Acid—picric 6x. Furuncles were among the provings of this drug, and Dr. Houghton first used it at the Ophthalmic Hospital. Many years of trial have demonstrated its great usefulness. Besides the symptoms common to the condition, general debility is the indication.

Aconite relieves in the very early stages where there is restlessness, flushed face, full bounding pulse and anxiety. This picture is seldom seen.

Belladonna has produced boils and is indicated where there is marked redness, severe throbbing and general violence of symptoms coming and going quickly.

Calcarea picrata is an unproved combination of our best drugs, and is as nearly a specific as anything can be. It is wonderful how a case where one feels that active local measures must be used improves under this remedy. Since Dr. Houghton introduced it no other has been as frequently prescribed.

Hepar sulphur, an impure sulphide of calcium, will often check an impending suppuration when given in the higher potencies, while in the lower ones it will promote it when inevitable.

Silica is useful in long lasting cases with a thin discharge, especially occurring in fat, lymphatic persons.

Sulphur should be given in frequently recurring attacks.

CHRONIC CIRCUMSCRIBED EXTERNAL OTITIS.

Occasionally a sebaceous cyst within the meatus will repeatedly refill and discharge its contents and persist for a long period of time. Thorough irritation of the sac or dissecting it out is the only way to effect a cure.

In the bony portion of the canal there may be a carious spot as a secondary condition resulting from a more deeply seated disease. This will receive consideration together with mastoid diseases.

DIFFUSE EXTERNAL OTITIS.

This may be acute, chronic or secondary.

Etiology.—The acute form is rarely idiopathic, but caused by an irritation of the integument, either mechanically or from liquids instilled for some real or imaginary condition.

A long standing, quiet, middle-ear suppuration may suddenly light up an acute disease of the canal. Not infrequently a particularly virulent or badly treated furuncle may excite general inflammation. Rarely it may result idiopathically from an exposure to cold or during the course of a profound constitutional malady.

Symptoms.—Itching and a feeling of fullness and heat are first complained of; these symptoms being common to all diseases of the canal. Pain follows quickly, often becoming intense. There is generally some tinnitus and occasionally vertigo. If the membrana tympani is much swollen or the canal becomes blocked with exfoliated epidermis and detritus there is deafness.

Pain is so severe that the patient often fails to mention other symptoms. There may be chill, fever, swelling of the glands and impaired movement of the jaw. Objectively in the early stage there is a congested and narrowed canal with tenderness in all parts to the touch of the probe. Later the canal becomes sodden from broken down infiltrated epidermis and transuded material. This may occlude it wholly or a small space may be left for observation of the drum membrane.

Pressure on the tragus and any manipulation of the ear is extremely painful.

The auricle may stand out from the head more prominently than its fellow. If the drum membrane can be seen and is clear or but little changed it becomes easy to differentiate from acute suppuration of the middle ear.

Often the necrosed epithelium and exuded material blocks the deeper portion of the canal and necessitates wiping it away with the cotton carrier or, better still, its removal by the syringe. The canal then presents a bright red and moist surface. This desquamation and accumulation is usually repeated several times and in markedly reduced tubal lumen is removed with considerable difficulty. The discharge may become purulent and excoriating. In neglected cases or when too much moist heat has been used there may be granulation tissue or polypi produced.

Prognosis.—The results depend on the complications and the cause. When idiopathic and uncomplicated, prognosis is good. A permanent contraction of the canal at some point may remain after severe cases.

Treatment.—The canal should be kept clean either by the cotton probe or with the syringe, and the latter, if rather hot water is used, generally reduces pain and congestion. In cases of severe pain the fountain syringe may be used for some hours with good effect.

The canal should never be left in a wet condition, but thoroughly dried and powdered boric acid dusted in. As a local anodyne Magendie's solution warmed and dropped into the canal gives great relief. Muriate of cocaine in four or ten per cent. solution is much used, but is rather inferior, its action being slow and uncertain through epithelium.

These cases are so frequently complicated that no definite line of treatment can be laid down. When the acute symptoms have subsided carefully applied solutions of carbolic acid or nitrate of silver do much good, especially when a state seems to have been reached where little change occurs.

Among the homœopathic remedies may be mentioned:—

Arsenicum album.—There will be red and inflamed surfaces, with vesicles, watery and excoriating discharge. The field for arsenic is in persons of a low and exhausted vital condition. Those who have skin diseases and suffer from nervous restlessness.

Arsenicum iodatum is given for the same symptoms, but is considered to be of deeper action and to produce results when arsenic has failed.

Aurum.—Especially in scrofulous or syphilitic cases and if there be a spot of denuded bone.

Belladonna.—In the acute stage with great pain, red and dry skin.

Calcarea carbonica.—In fat and scrofulous children. The discharge will be thick and the pain slight. Granulations readily form.

Calcarea phosphorica.—In a similar but later condition where there may be ulceration or excoriating discharge.

Ferrum phosphoricum.—In the early stages where aconite would ordinarily be thought of.

Hepar sulphuris.—With thick yellow pus, sensitiveness to the least cold air, relieved by heat and wrapping.

Graphites.—With a thin, bloody and offensive discharge and particularly if there be moist cracks about the meatus or behind the ears.

Psorinum.—In thin, nervous, and strumous children. Thin, excoriating and glutinous discharge. External meatus red and oozing. Scabs form easily.

PARASITIC DISEASE OF THE CANAL.

Etiology.—In cases of chronic disease of the osseous canal or suppuration of the middle ear with a swollen and sodden epidermis lining the canal, especially with a large perforation of the tympanum, there exists a suitable soil for the lodgment of germs. Those most frequently found are the vegetable parasites, *aspergillus nigricans* and *flavescens* and the *pencillium glaucum*, the latter being most frequent.

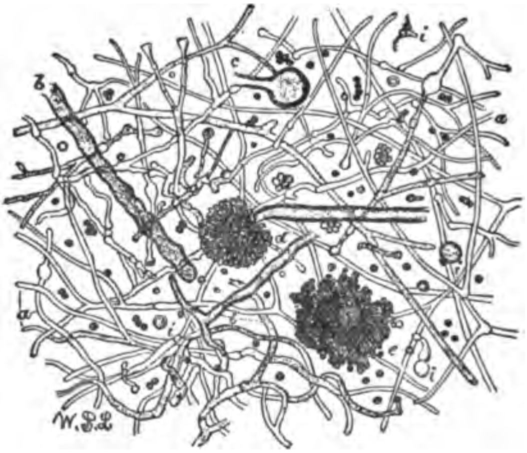


Fig. 6. Aspergillus Nigricans (220 diameters).

a, mycelium fibre ; b, fruit-bearing fibre; c, naked sporangium ; d, sporangium covered with basidia only ; e, more mature sporangium : i, spores in a state of germination (after Roosa).

More than one variety may be present in the same case.

In a suitable bed combining heat, moisture and absence of direct light these spores produce a groundwork of microscopical mycelium fibers from which rise little rods ending in a bulb covered with new spores, which when ripe fall back and extend the growth. Thus under favorable conditions the mass may fill the canal.

Symptoms.—These vary with the complications and the degree of occlusion. There is no discharge as a rule, the growth using it up in its own production. Through the speculum the appearance is more or less velvety white.

Treatment.—A syringe has no effect on this form of a plug. It can only be torn away piecemeal or with a curette, in either case leaving a moist and red base. To destroy the germs a fairly strong solution of bichloride of mercury, nitrate of silver or carbolic acid must be carefully applied with a cotton carrier just where needed, and otherwise the canal should be kept dry. Naturally, this form of disease is not seen except in persons accustomed to a filthy mode of living.

When once an effort is made to remove the mass it should all come away at the one sitting. A bichloride of mercury solution, 1 to 4000 or 5000, should be allowed to remain in the canal for several minutes and followed by hydrogen dioxide. When this has ceased to effervesce the canal should be dried out and then subjected to the effect of a solution of carbolic acid, 12 per cent in glycerine, for, say, ten minutes. The canal is dried again and dusted with iodoform, aristol or boric-acid powder.

Homœopathic medicines have no field here.

FOREIGN BODIES IN THE AUDITORY CANAL.

These cases represent about one per cent. of all ear cases coming to the clinics and are mainly among children. Such objects as beans, beads, pieces of paper, lead pencil, etc., are found which they have inserted into their own ears, or permitted their playmates to put there. In older persons accident is generally the cause, occasionally bugs, flies and living lavæ are discovered.

Symptoms.—When an insect lodges itself in the ear the pain and noise caused by its efforts to escape are quite intolerable. Children are frequently brought to the physician by careful parents before there are any symptoms produced by the ordinary foreign body. Very serious symptoms may develop in some cases where there would otherwise be none except for the unskillful manipulations of some physician previously consulted. Small objects, such as hair or a piece of exfoliated epidermis, sprung between the anterior wall and the drum, cause the subjective symptoms of a crunching noise and perhaps pain.

Smooth round objects are liable to be wedged into the constricted portion of the osseous canal. The epithelium anterior to it then becomes swollen partly from pressure and partly from manipulation. Pain may be considerable and there may be a sanious discharge.

Bodies small enough to pass the constriction may be impacted between the drum and anterior wall, making such pressure on the former as to cause inflammation, pain, and noise constantly or at least during mastication. Suppuration and perforation may likewise occur in neglected cases.

An irritating persistent cough may be caused by an object pressing on the recurrent laryngeal nerve in the canal.

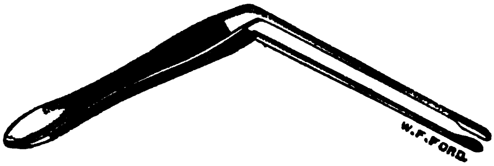


Fig. 7. Wilde's angular ear forceps.

Treatment.—Small bodies may be removed by the forceps. Water from a large size metal syringe throwing a small stream will remove most foreign bodies if they are not firmly impacted nor of a vegetable nature. Great force is exerted behind the object by this method, and no harm can result if the body be not such as would swell in the presence of water.

In cases of larger bodies firmly wedged the careless use of forceps only serves to make matters worse. Here we must rely on delicate hooks or a very fine curved ring probe, the hook to be inserted on the flat and the point made to describe a quarter circle as it passes over the object. Considerable force is justifiable when we know the hook is in the right position. The ring probe should enter on the flat and be made to exert a downward and forward pressure as it passes behind the body.

Many objects may remain in the canal for years without ill effect. In exceptional cases it may be necessary to dissect off the auricle posteriorily to straighten the canal and get a better view. I once removed an object by placing a camel's-hair brush moistened with strong glue against it. When it dried both came out together.

After-treatment will be such as is appropriate for any complications which may develop, or for such injuries as may be made while removing the foreign substance.

NEW GROWTHS IN THE CANAL.

EXOSTOSES.—These bony growths occur in any part of the osseous canal. They are never congenital and never painful unless they press upon the drum. The most frequent form is the hyperostosis which is diffuse, of ivory hardness and contracts the canal more or less symmetrically. The exostosis proper is softer, rather cancellated, more prominent and inclined to be pedunculated. They may be large, small or multiple.

Etiology.—Syphilis, rheumatism, exposure and otorrhœa are among the causes ascribed for these conditions, but in only a small number of the cases will there be such a history.

Symptoms.—Loss of hearing will result in cases where the growth occludes the canal, or when not quite closed if wax gathers and agglutinates behind it, or in case an otorrhœal discharge becomes dammed up. Pain will result if there be pressure on the drum membrane.

Treatment.—Removal by surgical means is the only recourse. When pedunculated they may be cut with a chisel or wire. Otherwise the burr or trephine used with a dental engine or motor is needed. When no danger exists of injury to the drum and considerable space remains interference is not justifiable.

An operation is appropriate when the space is small, the growth relatively rapid and wax tends to form in quantity behind it. In such a case closure would result in damage to the tympanum by the ultimate pressure of wax. If suppuration then began, the patient would be exposed to all the dangers of retained pus.

Again, where an otorrhœa already existed behind a small remaining space it would demand operative measures. With the dental motor the bony structure is cut away rapidly, but a good view of the progress is prevented by the free bleeding which always results. This may be prevented in a measure by the frequent use of pledgets of cotton carrying a styptic solution. When space permits, the danger of injury to the drum by the sudden slipping through of the terminal may be made as slight as possible by stuffing cotton into the lower end of the canal.

Not infrequently it becomes necessary, for the sake of more room and a straighter canal, to make the post-auricular incision such as is made in mastoid cases and displace the auricle forward. The operation may then be completed with chisels, or the dental burr.

Considerable reaction usually follows the operation and granulations develop. These latter may be treated, after a few days, by a saturated solution of bichromate of potash, or other caustic, very carefully and directly applied. Other forms of treatment on the theory of the cause, as syphilis or rheumatism, are not recommended.

SEBACEOUS AND CERUMENOUS CYSTS of the canal are not of frequent occurrence. Simple incision and expression of their contents will seldom effect a cure. They should be curetted and the sac wall destroyed.

WARTY GROWTHS demand excision and perhaps the touching of the stump with the electro-cautery.

POLYPI may develop from redundant granulations in some part of the epithelial lining of the canal and are more amenable to treatment than when from the middle ear. The scissors or wire snare will quickly remove them and the application of a saturated solution of bichromate of potash will prevent a return.

MALIGNANT GROWTHS have been reported as primary in the in the canal, but they are so rare and their treatment so in accordance with the same condition in other parts of the body that it needs no mention here.

THE MEMBRANA TYMPANI.

ANATOMY.

The drum membrane at the inner end of the canal separates it from the tympanic cavity and is of oval form, the long diameter (9 to 10 mm.) being vertical.

Its position is oblique, making an angle of nearly 45° downward and inward.

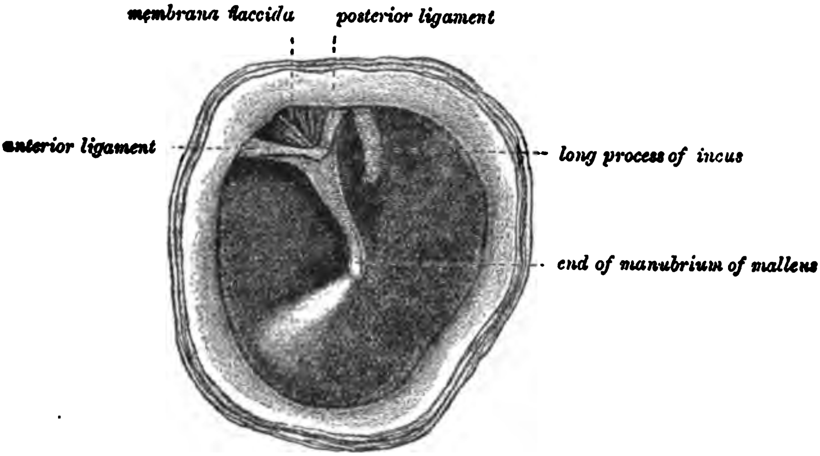


Fig. 8. Membrana tympani, as seen with the speculum. (Hensman.) Outer surface.

It is composed of three layers. The outer of epidermis without glands or hair follicles, continuous with that of the canal. The inner of mucous membrane, continuous with that of the middle ear. The middle or fibrous layer gives to it its strength and toughness and is arranged in two laminæ. The outer is of radiating fibers from the *umbo* or tip of the long arm of the malleus to the sulcus tympanicus. The inner laminæ is of concentric fibers. Taken together these constitute the membrana propria, which has to do with the receiving of sound waves and transmitting them to the bones of the middle ear. At the periphery these fibers are increased in numbers and form a tendonous ring, The total thickness of the drum membrane is $\frac{1}{250}$ of an inch.

In the upper part and behind the short process of the malleus is a small section, which is devoid of the fibrous layer, known as the *membrana flaccida*, or *Shrapnell's membrane.* Above and posteriorly there is a notch on the temporal bone and near it in the membrana flaccida a small closed foramin. Both receive the name of *Rivini.* In some ears the foramen can not be demonstrated, but certain persons, by Valsalva's experiment, can force air through it. Extending downward from the upper slightly anterior part of the membrane, and enclosed within it, is the long arm of the malleus.

The epithelial layer is reflected over its outer aspect as the mucous membrane is over its inner. The fibrous laminæ, however, are intimately and firmly connected with its periosteum. Every movement, then, of the membrane is conveyed to this bone.

Viewed from without the drum membrane is very slightly concave from the umbo to the periphery, and from this concavity there is a bright reflection of light in the shape of a triangle, with its base downward and forward and the apex at the umbo. The changes in this *light triangle* are important diagnostic signs of diseases of the membrane and middle ear.

Since the *chorda tympani* is as closely connected with the drum membrane as with any other of the ear structures, and as it performs no function with any of them, it may as well be described here as elsewhere. On its way to the tongue it affords the unique instance of a nerve crossing an open air space with only a covering of mucous membrane. It emerges from the outer wall of the middle ear at the posterior and upper boundary of the drum membrane. It passes forward through the cavity of the tympanum between the handle of the malleus and the vertical long arm of the incus to its upper anterior angle and then downward, and has its exit from that cavity through a foramen at the inner side of the Glaserian fissure.

The *annulus tympanicus* is a U-shaped bone within the temporal bone, having a cartilage lined groove on its inner surface to which the membrana tympani is attached.

TRAUMATIC INJURIES TO THE MEMBRANA TYMPANI.

Gruber has proved that the normal drum membrane in conjunction with a healthy middle ear and tube may sustain the pressure of several atmospheres. Sudden increase of air pressure, however, beyond such a point or where disease has impaired these structures will rupture the drum. Instances of this kind are seen where the patient has had a direct blow on the ear or been exposed to an explosion. Divers and workers in tunnels which are under water-ways, and so divided into caissons, often suffer the same result under similar circumstances.

The introduction of hairpins, toothpicks and straws either for the removal of wax or to allay itching, and the incompetent or careless instrumentation at the hands of the physician in removing a foreign body, have caused ruptures of this membrane. Both Valsalva's and Politzer's method of inflation have had the same result, but only when the membrane has been in a weakened condition. Fractures at the base of the skull are occasionally complicated with a rupture of the drum membrane, or in bad falls and contusions without a fracture of the skull a rupture may occur.

Several authorities have reported a fracture at the handle of the malleus from concussion or direct violence. Shrapnell's membrane not having the fibrous layer is capable of relieving the rest of the membrane of much of the sudden pressure in the class of cases mentioned, and it is due to its elasticity that injury does not more frequently result.

Perforations may be in any portion of the membrane, but are most frequent in the anterior and inferior portion and parallel to the manubrium. As a rule they are at first slits, with their edges in apposition, but they may be rounded or become so through succeeding inflammation. When no previous catarrhal process has existed in the middle ear, healing may be by primary union and hearing fully restored. When such a desirable result is not attained there will be a middle ear disease set up of more or less severity and followed by a reduction of hearing and perhaps tinnitus.

Even when a considerable opening in the membrane is made by the inflammation it may close again by newly formed connective tissue, the fibrous layer never being reproduced.

Treatment.—In cases where no diseased condition has preexisted there is strong reason to expect a spontaneous recovery, and nothing should be done beyond protecting the suddenly exposed middle ear from cold by a pledget of cotton in the canal. In other cases the use of Politzer's and Valsalva's inflations may be added if there be reason to believe that a low grade of catarrhal inflammation has existed in the tube or tympanic cavity. When a purulent middle ear disease results it must be treated accordingly, as will be hereafter set forth.

MYRINGITIS.

As a primary inflammation this is a rare disease. Some two years ago I saw a patient with what was apparently an uncomplicated myringitis. This gentleman had no signs of, nor were there any symptoms of previous middle or external ear diseases. For about a day all sounds perceived by his right ear had been muffled and indistinct. An examination showed a congested membrane most marked at the upper and posterior portion in one definite spot. Valsalva's experiment was performed without effort and had no effect on the hearing. On the following day the point of greatest congestion had developed into a small blister which I pricked with a needle, when it collapsed with the escape of a minute quantity of pinkish serum. This opening was not through all the layers of the drum membrane, for Valsalva's experiment caused no passage of air through it. A little peroxide of hydrogen was carefully applied on cotton and the part dried. The congestion disappeared and hearing returned in a few days.

Inside of a month this same patient had a similar condition in the other ear with the same treatment and result.

I have recently reported another case which occurred in a youth, but which failed to afford me an opportunity for observation after the stage of the bleb.

These cases are occasionally the sign of a very insidious mastoiditis or periostitis of the mastoid.

A myringitis which does not go on to the formation of a blister, as the above case, may set up a chronic catarrhal inflammation of the middle ear by extension, but more generally there is a diffuse exudation into the epithelial layer, followed by resolution and more or less exfoliation.

Simple cases like this have very little pain and do not in many instances get to the aurist's attention. I have known of such cases resulting from the concussion of sea-waves against a bather's head.

Treatment.—Locally, nothing but protection from cold may be required in mild cases.

If a bleb forms it is best to open it with a very small, sharp blade.

Fig. 9. Paracentesis Knife.

Internally, *Aconite* would be the remeny in the earliest stage when congestion is the most marked symptom.

Belladonna in congestion with sharp shooting pains, aggravated by mastication and extending to the teeth. One of my cases also presented a feeling of dryness in the pharynx.

Hepar sulph., with sharp sticking pains, relieved by heat. Tendency to suppuration or when pus follows evacuation of the bleb.

ABSCESSES OF THE MEMBRANA TYMPANI.

Small abscesses occasionally form in the deeper portions of the dermic layer of the membrane, and like the bleds of myringitis are most liable to form posteriorly. The cause is obscure and similar to that of the condition just described.

Some have noticed a gouty diathesis in its victims and others have ascribed both this condition and the blebs of myringitis to a neuritis as in herpes. The color of the exudation is lustrous, non-transparent and yellowish green. The *symptoms* are more severe than with serous exudation. The pain is especially more marked at night and may last several days without intermission. When uninterrupted the abscess rarely opens otherwise than into the canal and recovery is generally complete. Its contents may reabsorb or undergo a chalky degeneration. When a spontaneous opening occurs the membrane will show more or less streaky opacities afterwards.

Treatment.—It is best to open any pus cavity when it has formed, and before that time treatment would not differ from that for acute catarrhal inflammation of the tympanum. Discussion of perforations of this membrane will be given under the chapter on results of chronic purulent inflammation of the middle ear.

THE MIDDLE EAR.

ANATOMY.

From a clinical standpoint the middle ear is the most important part of the hearing apparatus It is divided into—(1) The tympanic cavity; (2) the Eustachian tube; and (3) the mastoid cells.

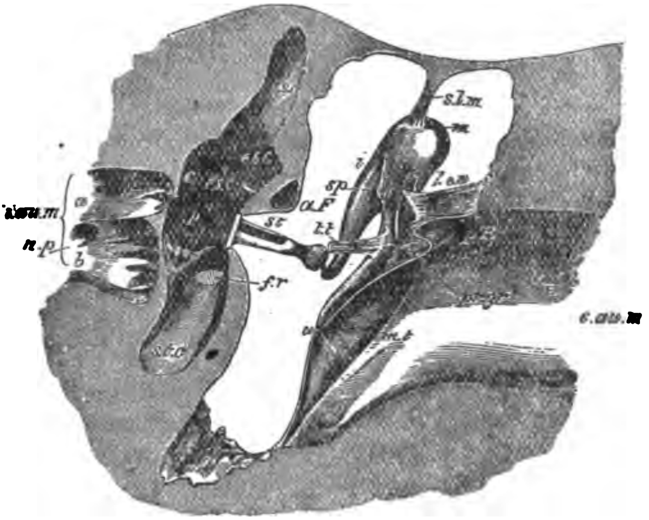


Fig. 10. Profile view of the left membrana tympani and auditory ossicles from before and somewhat from above. Magnified four times. (E. A. S.)

M, head of the malleus; *sp*, spur-like projection of the lower border of its articular surface; *pr. br*, its short process; *pr. gr*, root of processus gracilis, cut; *s. l. m*, suspensory ligament of the malleus; *l. e. m*, its external ligament; *tt*, tendon of the tensor tympani, cut; *i*, incus, its long process; *st*, stapes in fenestra ovalis; *e. a. u. m*, external auditory meatus; *pR*, notch of Rivinus; *mt*, membrana tympani; *u*, its most depressed point or umbo; *d*, declivity at the inner end of the external canal; *i. au. m*, internal auditory meatus; *a* and *b*, its upper and lower divisions for the corresponding parts of the auditory nerve; *np*, canal for the nerve to the ampulla of the posterior semi-circular canal; *s. s. c*, ampullary end of the superior canal; *p*, ampullary opening of the posterior canal; *c*, common aperture of the superior and posterior canal; *e. s. c*, ampullary, and *e. s. c*, non-ampullary end of the external semi-circular canal; *s. t. c*, scala tympani cochlea; *f. r*, fenestra rotunda; *a. F*, aqueduct of Fallopuis.

The *tympanic cavity* is an irregular wedge-shaped chamber interposed between the external and internal ear, designed to transmit sound waves faithfully and to protect the delicate mechanism of hearing from external violence.

From above downwards, and from before backwards, the dimentions of the cavity vary from $\frac{3}{5}$ to $\frac{1}{2}$ an inch, but from without inwards the distance is only from about $\frac{1}{8}$ to $\frac{1}{12}$ of an inch. It is lined with mucous membrane, having ciliated cells near the Eustachian tube, and is so intimately connected with the bony walls that it acts as their periosteum. Caries is very liable therefore to result from long-continued purulent and ulcerative processes.

Its outer wall is mainly made up of the membrana tympani, as has been already described. The tympanum extends above the upper edge of the membrane, and so a disc of bone forms a part of the wall in this place. Two smooth depressions in this bone serve to hold the bodies of the hammer and anvil.

At the anterior portion of the outer wall is the *fissure of Glaser*, which lodges the *processus gracilis* of the hammer. Close by this fissure is the small foramen by which the chorda tympani nerve makes its exit from the tympanum. The course of this nerve has already been described.

The roof of the tympanum is much wider than its floor and is formed of an osseous plate of the temporal bone, which is generally very thin and may be deficient, as it always is in fœtal and early infant life. This plate extends beyond the tympanum, forming the roof of the Eustachian tube, the canal for the tensor tympani, the osseous portion of the external aural canal, and the upper wall of the mastoid antrum.

The floor is narrow, in consequence of the outer and inner walls being inclined to each other It passes without any sharp demarcation into its several boundaries. The plate of bone which separates it from the bulbous end of the jugular fossa is quite thin and occasionally incomplete. The tympanic nerve reaches the inner wall through a small aperture in the floor.

The *inner wall* of the tympanum is quite uneven and separates it from the internal ear. It presents above, the *oval window* (3 x 1½ m.m.), leading into the cavity of the vestibule, which, in a recent state, is occupied by a fibrous membrane and the base of the stapes. Just below and behind, in a slight depression, is the *round window* (1½ x 2 m.m.), also closed by a membrane and leading to the scala tympani of the cochlea. Above the fenestra ovalis is a curved ridge which indicates the position of the *aqueduct of Fallopius* and the *facial nerve*. Below it is a *slight promontory* indicating the situation of the first turn of the cochlea. At the junction of the inner and posterior walls is a minute *pyramid*, within which is the muscle and from which emerges the tendon of the stapedius.

The *posterior wall* is marked above by a large opening into the mastoid antrum and there are occasionally other smaller openings. The *anterior wall* is also uneven and merges gradually into the floor and roof. Near its upper part is the rounded end of the canal for the *tensor tympani* muscle. Just below this is the Eustachian tube. A thin plate of bone separates the tube from the half inch canal which lodges the fleshy part of the tensor tympani muscle.

The *attic* of the tympanum is made up of a space above the malleo-incudal joint by the reflections of mucous membrane from it to the roof and external wall. This space is divided into two or more pouches, and the posterior one usually communicates with the horizontal mastoid antrum. Purulent inflammations which may be located here are very chronic on account of the defective drainage, and are generally associated with a perforation through the membrana flaccida.

The *Eustachian tube* extends from the anterior wall of the tympanum downwards, inwards and forwards to the nasopharynx. It is about an inch and a half long and lined with a continuous mucous membrane which is ciliated, the motion being toward the pharynx. The upper half inch is of bone, the lower of fibrous tissue and the intermediate portion of elastic fibrocartilage. A portion of the fibers of the tensor palati muscle is attached to the lateral wall of the cartilaginous portion of the tube, and in the act of swallowing assists in opening its lower orifice.

The cartilaginous part of the tube is deficient laterally, being completed by fibrous tissue. The mouth is slightly above the level of the hard palate and posterior to the inferior turbinated bone.

The *walls* of this tube, which are flattened laterally, lie for the most part in apposition, and the diameter varies from two to five m.m., being greatest at either end and narrowed in the cartilaginous portion.

The mastoid cells are situated posterior to the cavity of the tympanum, and *the antrum*, the first and largest of them, is on a slightly higher level than its floor.

Their lining mucous membrane is also continuous with that of the tympanum.

From the antrum, which is about the size of a small pea, numerous irregular cavities or cells pass off into the substance of the mastoid portion of the temporal bone.

The number, size and proportion of spaces to the osseous tissue vary very much.

When large they leave but a thin plate of bone covering the mastoid process and protecting the posterior wall of the external canal. Sometimes many of the cells are not pneumatic, but are filled with fat and soft connective tissue. There are no cells in the fœtus and but few in the early years of life.

It is surgically important to remember that the *lateral sinus* of the cranial cavity is seldom more than half an inch posterior to the auditory meatus, and may be much nearer. Physiologically these spaces act as resonators.

The chain of bones in the upper part of the tympanum conducts waves of sound from the membrana tympani to the fenestra ovalis.

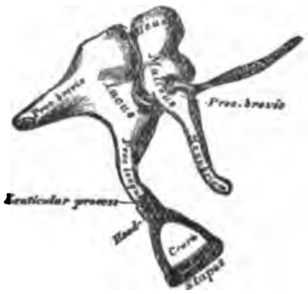


Fig. 11. The small bones of the ear, seen from the outside. (Enlarged.) (After Gray.)

The malleus, or hammer-bone (18 to 19 m.m. long), has a rounded head, which is placed above the upper edge of the drum membrane, and on the posterior surface of which is an elliptical depression, with prominent edges for articulation with the incus. Below this is a slight constriction, the neck, and, still more inferiorly, the various processes arise. The handle, long process or manubrium, passes downward and is inserted into the membrana tympani. The processus gracilis passes outwards and forwards to the fissure of Glaser. The short process is a small elevation projecting directly outward and seen as a small white point at the base of the handle. Opposite to this is the attachment of the tendon of the tensor tympani.

The incus is the intermediate bone, named after the anvil, but shaped more like a molar tooth with deviating fangs.

The body has a large articular surface divided into two facets, with a furrow between to receive the ridge of the articular surface of the malleus.

The short process projects backward and is attached near the entrance to the mastoid cells at the junction of the posterior and external walls by ligamentous fibers.

The long process is more tapering and passes downwards and inwards parallel to and just behind the handle of the malleus. At its extremity it bends quite sharply inwards and has a flattened tubercle tipped with cartilage for articulation with the stapes.

The stapes (3 to 4x2½ m.m,) is the innermost bone and is shaped remarkably like a stirrup. It consists of a head, base and two cruræ, one of which is a trifle longer than its fellow. The head is rounded, looks outwards and has a cartilage covered depression for articulation with the long process of the incus. The base is a flat, oval plate of bone covered with cartilage at its sides and below, and held by a fibrous membrane in the fenestra ovalis which it does not completely fill.

The cruræ diverge from the neck,—a depression below the head,—and curve to the extremities of the base. In a recent state a thin membrane fills in the arch they make. All the joints of the ossicles are lined with hyaline cartilage and have delicate synovial membranes. The *malleo-incudal joint* is such that any motion of the malleus inwards is quite closely followed by the incus, but the malleus can move outwards without dragging upon the incus.

MUSCLES AND LIGAMENTS OF THE TYMPANUM.

The *tensor tympani* arises from the cartilagenous portion of the Eustachian tube and the adjoining surface of the sphenoid bone, and also from the walls of the bony canal which enclose it.

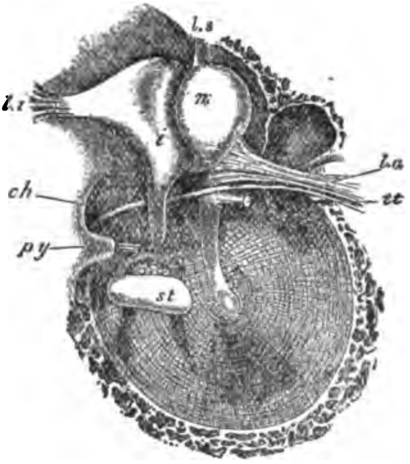


Fig. 12. View of the left membrana tympani and auditory ossicles from the inner side, and somewhat from above (E. A. S.) $\frac{4}{1}$

M, malleus; *i*, incus; *st*, stapes; *py*, pyramid from which the tendon of the stapedius muscle is seene emerging; *tt*, tendon of the tensor tympani cut short near its insertion; la, anterior ligament of the malleus, the processus gracilis is concealed by the lower fibers of this ligament; ls, superior ligament of the malleus; li, ligament of the incus; *ch*, chorda tympani nerve passing across the outer wall of the tympanum

This canal opens just in front of the fenestra ovalis, and the tendon of the muscle turns sharply around the cochlear-form process and passes directly outwards to its insertion in the handle at the malleus just below the neck. Its function is to render the membrana tympani tense.

The stapedius is a very small muscle contained in a canal o bone, and its tendon makes exit through a foramen in the summit of a pyramid at the junction of the posterior and inner wall. It is inserted into the posterior surface of the neck of the stapes. Its function is to press the hinder part of the base of the stapes into the oval window and lift out the anterior portion.

The *suspensory*, or *superior ligament* of the malleus passes from the roof of the cavity to the head of the bone. The *anterior ligament* extends forwards from the base of the processus gracilis to the fissure of Glaser. The *external ligament* has a broad origin at the notch of Rivinus and converges to the short process of the malleus. The *ligament of the incus* extends from the short process to the posterior wall, but also spreads outwards and inwards.

VESSELS AND NERVES OF THE TYMPANUM.

The *tympanic branch* of the internal maxillary artery chiefly supplies the anterior portion of the cavity. The mastoid cells and posterior part of the tympanum is supplied by the *stylo-mastoid* branch of the posterior auricular artery, through the aqueduct of Fallopius. The middle meningeal sends the *petrosal branch*, and there are also small ones, direct from the internal carotid through the bone. These vessels freely anastomose.

The *tympanic veins* empty into the superior petrosal sinus and the tempro-maxillary vein. The relations of the facial and the chorda tympani nerve to the tympanum have already been set forth.

A *nervous plexus* is formed on the promontory by nerves from both the petrosal, the sympathetic and the glosso-pharyngeal nerves. The tensor tympani muscle is supplied by the *internal pterygoid* from the otic ganglion. The stapedius has filaments from the facial.

EXAMINATION OF THE EAR FOR THE PURPOSES OF DIAGNOSIS.

Since a correct diagnosis can only follow a careful examination, it may be well to present a brief statement of the methods and instruments which experience has shown to be of value.

The symptoms volunteered or elicited, from the patient will lead the experienced otologist to a pretty accurate understanding of the probable condition, but a careful physical examination should never be omitted.

A recital of the patients symptoms should be patiently listened to. In the meantime a general observation of his appearance, whether he be anæmic, debilitated, gouty or syphilitic, may be made and supplemented by a few questions.

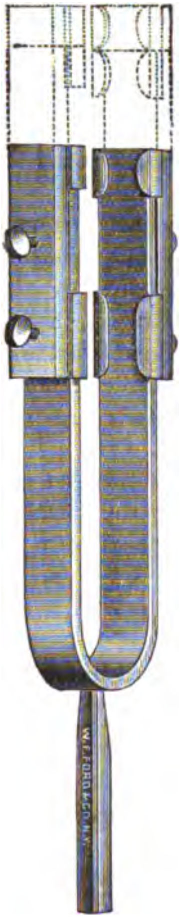

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Fig. 13. The Dench extension tuning fork.

Fig. 14. Tuning forks.

The *hearing power* of each ear should be tested separately, and for this purpose the *watch*, *tuning fork*, *Politzer's acoumeter*, or the *human voice* may be used.

The voice varies so, that for purposes of record it is unreliable. The fork is seldom used except where the bone conduction is to be tested or the internal ear is suspected. In the use of the watch it is necessary to know at what distance, in a quiet office, it can be distinguished by the healthy ear and this distance, in feet, can then stand as the denominator of a fraction; the numerator being the number of feet at which the patient hears it.

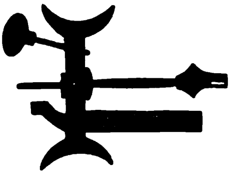

Fig. 20. Politzer's acoumeter.

If the patient hears at four feet the sound which a healthy ear would perceive at ten, the result would be noted as, H.$=\frac{4}{10}$.

Politzer's acoumeter is really the test type of hearing and like the latter has the merit of being precise. Each stroke can be heard at a distance of forty-nine feet (fifteen meters) by the normal ear. Like the watch, it is held directly away from the ear to be tested, the other meatus being stopped.

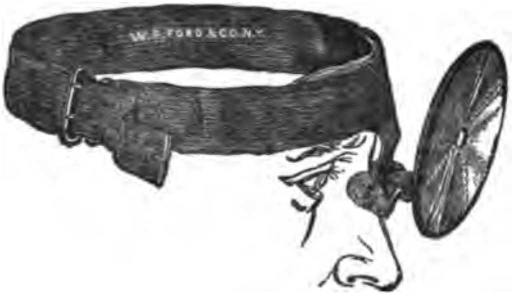
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Fig. 15. Head mirror with band.

The sounding cylinder is tuned to C., the hammer is caused to strike by the second finger, and the thumb and forefinger hold the instrument by its concave plates. A record of the acuteness of each ear is made the same as with the watch.

Both ears should be then examined with a good light and a head mirror, even if complaint is only made of one. After a first visit if one ear be found normal this may be omitted. Daylight will do, and it has the merit of showing the exact colorings of the parts examined, but it depends so upon the time of day and the location of windows that it is far better to be accustomed to an artificial round light, as the gas or Argand students lamp.

The concave mirror should be about 3½ inches in diameter and focus at about 8 inches.

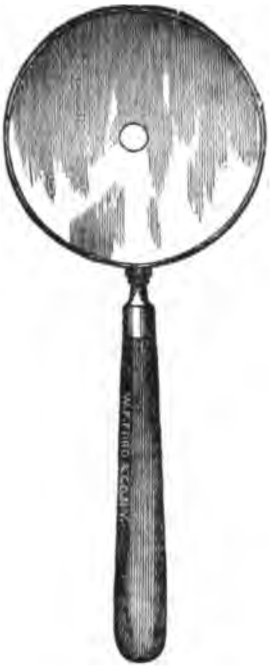

Fig. 16. Otoscopic mirror for hand use.

Such mirrors are used with a headband or attached to a horizontal arm of the lamp. The observer's line of vision is in the bundle of focused light when he looks through a small opening in its centre.

Some aural canals are quite straight and large, so that an examination is easily made, but ordinarily it will be necessary to correct the normal tortuosity of the canal by drawing the auricle upwards and backwards.

A silver or plated speculum will also be often needed, especially if the canal be well supplied with hairs, is unduly bent, or swollen.

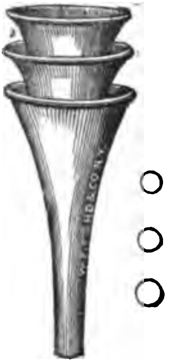

Fig. 17. Toynbee's ear specula.

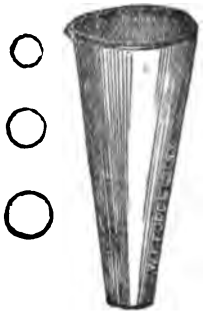

Fig. 18. Wilde's ear specula.

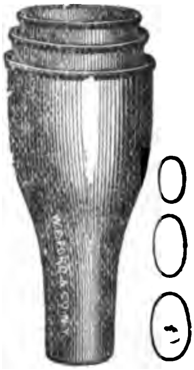

Fig. 19. Gruber's ear specula.

Specula are conical and round or oval and the latter shape fits the majority of canals best. In the placing of the speculum, and in all examinations of the ear, gentleness should be observed.

A good illumination must be had, and if the speculum fail to slip in when the auricle is drawn, backwards a slight rotary motion will help it to do so. Nothing should be done in the dark and no great force should ever be used, still, the largest speculum that can be conveniently inserted is the one to use. If you use a smaller one you will have to wiggle it around to get a view, and by so doing injure the sensitive lining of the osseous canal.

Having obtained an entrance to the canal it is possible that our way may be blocked by a mass of cerumen, a scale of exfoliated epithelium, a layer of such scales, a foreign body, or the product of suppuration, and, although they may receive mention elsewhere, it is well to detail collectively the instruments which might be needed to clear the passage.

Fig. 21. Silver Probe,

The careful physician will have at hand a *slender cotton carrying probe*, a *fine silver probe*, a *fine blunt ring probe* with the ring at an angle of 5° or 10° to the handle, a *curette*, a *pair of forceps*, and a *good syringe*. In a majority of cases the only instrument needed will be the cotton holder.

When a foreign body, mass of cerumen, or any other collection of material size is to be removed it may be a question what instrument to use, the probe, hook, ring probe, forceps or syringe, and to those who may lack experience perhaps no better advice could be given than to say, —"No mistake will be made if you use the syringe." Whenever water is used in the canal it should be antiseptic (bichloride solution 1 to 5,000 or 10,000) and the canal thoroughly dried afterwards. *Water is a "foreign body"* to the canal, and when used should always be thoroughly dried out.

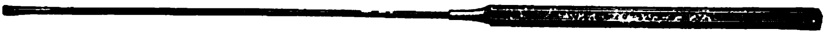

Fig. 22. Cotton carrying probe, with a triangular tip.

The curette with a cutting edge is but seldom used, and for it and the forceps no satisfactory rules for using can be written. Great care in their handling must be exercised to avoid damage to the structures.

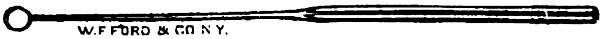

Fig. 23. Sharp ring curette.

The blunt ring probe, small and delicately made and with the ring slightly bent to the handle, will lift out most masses of cerumen which are near the meatus and do not fill the canal.

It has been stated that the tympanum should be ventilated by each act of swallowing. When such is not the case an idea of how much the Eustachian tube is occluded may be had by resorting to the *method of inflation*, which is called "*Valsalva's*."

This requires no apparatus whatever, and is done by the patient as follows: With a thumb and finger of either side he closes the ear and nostril of the same side, and then, having made a full inspiration, he makes an effort toward blowing the nose. As no air can escape some of it passes through the tube and inflates the tympanum. Sometimes this causes a sharp or loud noise, but ordinarily only a "stuffy" feeling, which passes off at the next effort at swallowing. If the air passed to the ear with little effort it would indicate that the tube was in fair condition. All degrees of permeability are met with and one tube may differ markedly from its fellow. When this occurs in young persons an examination of the naso-pharynx may reveal hypertrophies and adenoid growths as a cause.

Politzer's method of inflation is to be used where Valsalva's fails, and is performed in the following way: The instrument consists of a rubber bag three or four inches in diameter with a rubber tube, of at least a foot in length, fitted at its further end to a hard rubber nozzle to fit into one of the patient's nostrils. The nozzle may be made with a chamber in which cotton can be placed to carry a medicament or vapor.

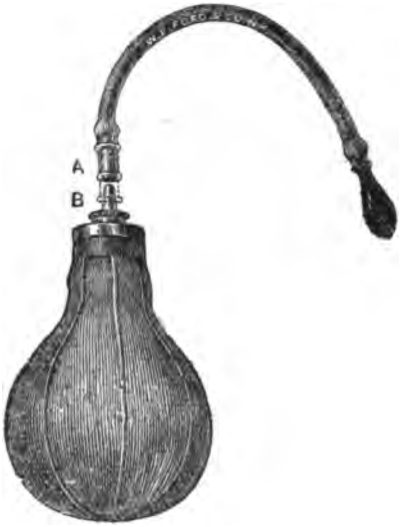

Fig. 24. Politzer's air bag; six ounces.

The physician takes the bag in his right hand, places the nozzle in one of the patient's nostrils and closes the other by pressure of his finger. In order to close the naso-pharyngeal space from the pharynx the patient may be directed to say "hoch," to whistle, to blow, or to perform the act of swallowing. At the moment of so doing a quick compression of the bag will cause air to pass through the Eustachian tube to the tympanum.

The best method is by swallowing, the patient to have a little water in the mouth, for that act tends, in itself, to open the pharyngeal end of the tube. Should there be stenosis at some point of the Eustachian tube, the difficulty of inflation will be a good measure of its extent. When inflation is easy, this method furnishes a good knowledge of the mobility of the drum membrane, if it be observed during the act.

Stenosis of the Eustachian tube is usually most marked near the pharyngeal opening, and in cases where neither Valsalva's nor Politzer's method serves to inflate the tympanum it becomes appropriate to use the *Eustachian catheter*.

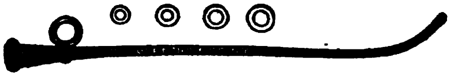

Fig. 25. Eustachian catheter.

This instrument consists of a hard rubber or silver tube about five and a half inches long and an outside diameter of a little less than one-eighth of an inch. The distal end is gently curved to an angle of about 45° and the proximal is enlarged and funnel-shaped, and also fitted with a ring or other projection to mark the direction of the curve.

The funnel-shaped end of the Eustachian tube is made to easily and accurately receive the hard-rubber cone-shaped tip of the tubing of an inflation bag.

The point of the tube is made to traverse the floor of the nasal cavity, with the back of the curve upwards till it reaches the posterior wall of the pharynx. It is then slowly withdrawn, the end being firmly pressed downwards till the curve is felt to press on the soft palate. Then it is rotated outwards until the ring or projection at the proximal end indicates that the point is directed upwards and outwards, when it may be felt to engage the mouth of the Eustachian tube into which it should be inserted a short distance. When really engaged in the mouth of the Eustachian tube, the catheter will not move during the act of deglutition. Some little manipulation may be necessary to find the mouth of the tube and no force should be used to effect an entrance. Considerable practice is required to become skillful. Just behind the mouth of the tube is the *fosse* of *Rosenmüller*, and if the instrument's point engages here it gives a feeling much like that when really in the tube. Having effected an entrance and attached the soft rubber tubing of Politzer's bag the tympanum can be inflated by a degree of compression in proportion to the degree of stenosis.

Siegel's otoscope is a hard rubber speculum fitted with a soft rubber tip so that it may conform to the irregularities of the external canal. The large end is air-tight and has a glass front through which the membrane can be observed. Leading from this large end is a rubber tube ending in a mouth-piece or syringe with which to exhaust the air in the speculum and canal.

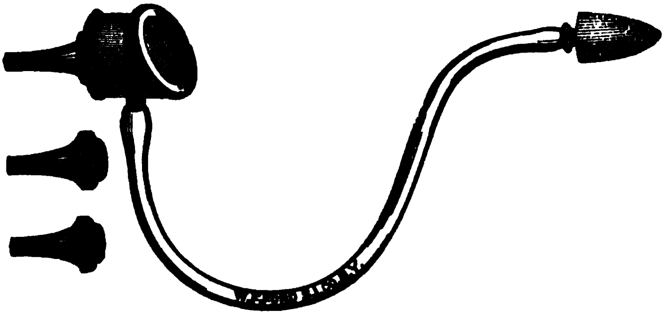

Fig. 26. Siegel's otoscope.

By alternately forcing in and exhausting the air diagnostic information can be obtained of the membrane; its movements, perforations, attachments and adhesions. Massage to the membrane and articulations can be applied in this way and adhesions may be broken.

The *Toynbee auscultation tube* consists of about two and a half feet of soft-rubber tubing with a black hard-rubber earpiece at one end and a white one at the olher. The white one is for the operator's and the black for the patient's ear.

With this tube in position the operator may hear the sound made by the entrance of air into the patient's tympanum. The sound made by the entrance of air through a normal Eustachian tube may be best described as breezy, while that produced by more or less stenosis is squeaky and high-pitched. It is always

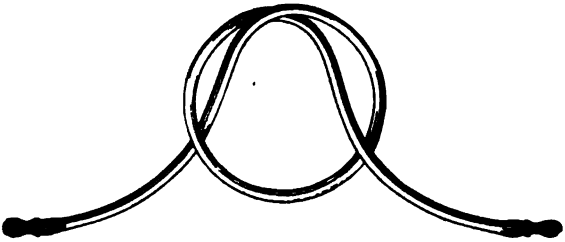

Fig. 27. Toynbee's auscultation tube.

well to use this when using the Eustachian tube and inflation-bag because it is unsafe to rely on the patient's word as to whether air has entered the tympanum.

DISEASES OF THE MIDDLE EAR.

A PRELIMINARY CONSIDERATION OF INFLAMMATORY AFFECTIONS OF THE TYMPANUM, TYMPANIC MEMBRANE, AND EUSTACHIAN TUBES.

There is nothing peculiar about the pathological changes occurring in middle ear diseases except as they are modified by anatomical structure. A correct appreciation of these changes and the anatomy and physiology of the organ is necessary to a judicious treatment. It must be remembered that the membrana tympani is anatomically continuous with the lining of the canal externally and with that of the tympanum within. Inflammation, then, of either of these linings, and especially the latter, will easily spread to the tympanic membrane. It is possible, but exceptional, that an affection is primary in the drum membrane. Practically, in the vast majority of cases, the affections of this membrane must be considered with those of the contiguous mucous membrane.

In the cavum tympani the mucous membrane is so intimately connected with the bones that for practical purposes it may be considered their periosteum. Inflammatory and ulcerative processes in this cavity may, accordingly, be easily associated with superficial caries and osteitis.

The tympanic cavity also contains the three small bones, ligaments, minute articulations, synovial membranes, the secondary oval and round membranes, numerous nerves, and many blood-vessels, one of which has a direct origin from the carotid artery. All of these being in a more or less confined small cavity will suffer more from the same grade of inflammation than in other parts of the body.

Acute inflammatory attacks, catarrhal or suppurative, may subside and good hearing remain, or, they may destroy some of these structures or their functions and damage the hearing power.

Chronic inflammations will cause cellular infiltration, organization and fibrosis as in other parts of the system, and, occasionally in appropriate rheumatic subjects, calcification. From these processes, result sclerosis of the mucous membrane, adhesions, obliteration of the synovial membranes and anchylosis of the ossicles or of the base of the stapes in the oval window. All conditions of *deformity*, *thickening* and *infiltration* may be found in the tympanic membrane. The process is very gradual in the more chronic cases and may doubtless be traced from the stage of proliferation in the youthful to that of calcification in the aged.

Exudation into the tympanum may be had in every degree from simple mucus to the virulent pus of the otitis of scarlet fever, which swarms with micro-organisms.

The *non-purulent exudations* may, in like manner, vary in consistence from thin and watery to thick, stringy and adhesive.

Thus, it will be observed, that the middle ear diseases do not differ from those of other mucous membrane cavities except as to effects due to its anatomy and physiology.

The nasopharynx is responsible for most ear diseases; the progress being by direct continuity of tissue.

The intelligent treatment which the laryngologist of recent years is devoting to the so-called simple colds, snuffles, and coryzas of childhood must bear fruit in the reduction of the chronic deaf of the next generation.

What has been said of catarrhal inflammation and exudation in the tympanum applies equally to the Eustachian tube. This is the intermediate structure between it and the nasopharynx.

Chronic nasal catarrh always affects the tube and the incident proliferation and infiltration of cell elements must narrow it and may entirely close it. When this happens the tympanum is at once involved, for the air in it is not renewed and the membrane sustains the atmospheric pressure only on its outer surface.

Only the nasal orifice of the tube may be obstructed by inflammation, by adenoid growths or by a large nasal polypi.

Ulcerative processes and the contraction following extensive operations may obliterate the nasal orifice.

In making a diagnosis of middle ear disease the condition of the Eustachian tube and pharynx should receive attention and a prognosis rendered accordingly. Given a thickened and puckered membrana tympani and an occluded Eustachian tube; then any improvement of hearing is practically impossible.

CATARRHAL INFLAMMATIONS OF THE TYMPANUM.

ACUTE CATARRHAL INFLAMMATION OF THE TYMPANUM.

This is the form of inflammation of the middle ear where the symptoms develop quickly; with a decided hyperæmia of the membrane, and a muco-purulent fluid occupies the cavity. It is the "*earache*" of children.

Pathological investigation has shown that the fluid exuded into the cavity contains the pus corpuscle in the majority of cases; hence this form should be described under the heading of a muco-purulent inflammation; but custom has sanctioned the former classification and, as in cases where resolution terminates the disease, the presence of pus corpuscles cannot be proven, it is for a number of reasons still the better one to use.

Etiology.—The cause of otitis catarrhalis acuta is frequently found to be acute or chronic catarrh of the nasopharynx, exposure to wet weather, teething, bathing, rapid cooling of an overheated body, the exanthematous diseases, and nasal douches. Operations and applications to the nasopharynx may also be an exciting cause. It is more common in children and in the spring and fall of the year.

A variety of *bacteria* have been found in the secretion discharged immediately following paracentesis, such as the *streptococcus pyogenes*, the *diplococcus pneumonica*, and others, and from these some have sought to make it appear that this form of aural disease is infectious. No special form of germ, however, has been shown to be peculiar to the disease, and as the same germ found in the ear has always been found in the nasopharyngeal secretions it is reasonable to conclude that it passes through the Eustachian tube and becomes destructive in the confined cavity of the tympanum. Bacteria may lie dormant in the cavity or be excited to activity by cold or low vitality of the patient.

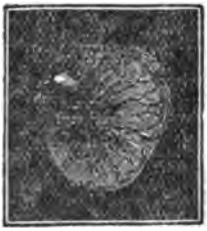

Fig. 28. Radiate vascular injection of the drum-head in acute inflammation of the middle ear. (After Politzer.)

It may be well to note here the pathological steps in the progress of a typical case. From various causes there will be a nasopharyngeal catarrh producing a congestion and swelling of the inferior end of the Eustachian tube.

Normally these walls are so closely approximated that very little swelling serves to quite close them and impair their function of drainage and ventilation. The secretions of the tympanum are therefore retained.

Air in this cavity is absorbed by the tissues and the effect of a partial vacuum produced. Operating with this condition is the steady pressure of the atmosphere on the membrana tympani through the canal.

The blood vessels are distended in the cavity, osmosis, swelling and increased secretion result. and a painful condition is produced. In this stage hearing may be muffled, but the patient is generally free from pain during the day. This is due to the upright position permitting some slight drainage and a subsidence of the tubal swelling.

If the case progresses beyond this stage the tube becomes occluded, the vacuum in the tympanum is nearly complete and a high grade of inflammation ensues. Pain will now be severe and constant

The membrane will be very much retracted, will lose its characteristic markings and present a uniform red color. The inward pressure of the membrane will carry the ossicles also toward the inner wall, their articulations will be strained and the *stapes will forcibly press into the oval window.*

Tinnitus will be produced by this increase of labyrinthine pressure and also by the abnormal contact of mucous surfaces in the tympanun occasioned by the false position of ossicles and membrane.

Now, *as the secretion of sero-mucus continues the pressure is relieved by its taking the place of the air absorbed by the tissues.* In this way it may come to occupy a large portion or all of the cavity. Occasionally its elevation or surface line may be detected through the membrane, and if the tube be now permeable *the formation of bubbles* may be observed when Politzer's bag is used. If, on the other hand, there be no drainage, secretion will be excessive and pressure will be outward and the membrane bulge in that direction. The greatest prominence will be at Shrapnell's membrane, where the resistance is least. The course of the disease from this point is in one of three ways.

Most favorable is *resolution*, where the secretion is absorbed, swelling subsides and the organ returns to its normal state.

Failing to do this, the *inflammation increases*, pus forms, a perforation is made and the secretions escape by the canal. It may not always seem so, but this is certainly next to the most favorable result, for it is quite amenable to careful treatment.

The third course and, unfortunately, perhaps the most frequent, is a *partial resolution;* a subsidence into a sub-acute condition, which passes gradually into a chronic middle ear catarrh.

Symptoms.—A feeling of fulness and numbness, or a headache, may precede the pain, which in adults is of a sharp, lancinating, intermittent character, most marked at night. Pain is increased by all movements of the throat and by pressure below the auricle.

In children the pain is vastly more severe, the child writhing in agony at night and during paroxysms; but the tendency to intermit is also more marked, and for several hours the parents may be deceived into thinking they have seen the last of it. The auricle and mastoid may be tender to touch. The patient's voice may resound in his ears. Pulsations synchronous with the heart's action is often felt and can occasionally be observed through the membrane. Subjective noises may be present. Vertigo and alterations in the sense of taste are rare occurrences.

In children there is commonly fever and an elevated pulse. Even delirium and convulsions may occur and an initiatory chill may be experienced. Hearing is much reduced and most marked in the stage of exudation following the severity of the pain, but bone conduction is rarely affected.

An *examination of the membrane* will show it to be much injected along the short and the long process and at the periphery, and it will lack its usual lustre. The more severe the form of inflammation the greater will be the injection of the membrane, and it may be so red and the blood vessels so numerous that the long process will be lost to view, only the tip of the short one remaining as a yellowish point.

The pressure of secretions cause a bulging of the membrane, most marked above and posteriorly, where one or more rounded and prominent blisters may form and discharge a reddish serous fluid into the canal. This appears much like the condition found in myringitis, but is not interlamellar.

Diagnosis.—There should be no difficulty in diagnosing an acute catarrhal inflammation of the tympanum if the drum membrane is carefully observed and the history inquired into. In young children it is not so easy, but if they have a severe coryza and occluded nares complicating any other condition they are practically in the early stages of a middle ear catarrh. This will frequently be the secret of their special distress and irritability, too often only discovered when the tympanum has ruptured to allow the escape of the pent-up muco-serum.

Treatment.—In children an effort should be made to clear the nostrils, and so open the Eustachian tubes and allow air to enter the tympanum. By passing sweet oil or vaseline into the nares—backward, not upward—on a camel's-hair pencil or cotton probe a flow of mucus will result with sneezing and coughing. This reduces the swelling and tends to open the tube, but Politzer's air bag should also be used to inflate the ear. It is not necessary that young subjects should swallow water, blow, or say "hoch," for, as a rule, they are crying, and that raises the velum, shutting off the nares from the pharynx. The method of using Politzer's air bag has already been described, and it is not modified in the case of children except as to the force used. Too great a force might rupture the membrane or increase the pain because of the violence of the concussion.

As a rule a gentle puff will inflate the tympanum and often stop the earache.

This should be repeated as needed once or twice a day.

Very great relief frequently follows the external application of heat, and this should be in the *dry* form, as a flat bottle of hot water, a hot salt-bag, or a hot water-bag.

Moist applications are not approved, because they promote maceration and may cause pus formation with a perforation of the membrane, which might have been prevented.

Beware of dropping solutions into the canal for the cure of "earache." This practice is responsible for very many cases of permanent deafness, and is older than the Christian era. Frequently they do not reach the membrane, but irritate the external canal. When in contact with the drum they macerate it, without in any way mitigating the inflammation within, thereby promoting a perforation. The variety of these ear-drops is legion, and they are as destructive in proportion.

I know of but one thing I would, in a gederal way, advise to drop into a child's ear, and that is sweet oil, not more heated than one can tolerate on the back of the hand.

It is a good plan to let the child constantly wear a cap lined with a thick layer of cotton wool, and confinement to the house should, of course, be the rule.

For the relief of the acute stage the authorities of the old school recommend the use of a purge to reduce the arterial tension; leeches to the tragus as a local derivative; a flying blister to the mastoid; the application of steam or continued hot water irrigation in the canal; solutions of morphine, atropine, or cocaine, alone or combined, to be occasionally dropped upon the drum.

Extreme pain in exceptional cases may warrant the adopting of some of these procedures for their physiological effect. Seldom, however, does the necessity arise in cases under management from the beginning, and especially if the internal remedy covering the symptoms has been faithfully given and the simple local measures above recommended are instituted.

In the adult the same treatment is to be followed, except when modified by the larger size of the canal. A little more liberty in applications through the canal may be taken, because their effects can be watched and any excess cleared away.

Paracentesis may even be performed, although more frequently called for in the purulent form of otitis media.

The special indication is when the tubal swelling is so great that the use of Politzer's bag causes no air to enter the tympanum. It is necessary that a good illumination be possible and the opening be made where the bulging or the inflammation is greatest, or in the posterior inferior quadrant.

The sufferings of the patient are usually immediately relieved, the inflammation subsides and the divided tissues reunite. There may be a little blood, bloody serum, or viscid mucus escape when the incision is made, but its effect is magical in the relief of pain.

After paracentesis the discharges should be removed, the canal disinfected, dried and protected by a little pledget of cotton.

When we come to consider the internal remedy it must be understood that the one to be selected is the one which best covers the totality of the symptoms, both in and out of the ear. Only those will be mentioned here which are most frequently indicated, and whose use has given signally good results.

HOMŒOPATHIC INDICATIONS.

Aconite should perhaps be a useful remedy in the earliest stage, but it is certainly very seldom used. Hughes quotes Bayes as finding it useful in acute otitis, but also adds that it has no proved homœopathic indications.

Belladonna will act well if its general characteristic symptoms are present, and would scarcely otherwise be prescribed. Great restlessness with over-excitability of all the senses. Sharp pains come and go suddenly. Flushed face with hard rapid pulse.

Chamomilla is used mainly in children's cases. The pain may be severe, certainly the child is extremely sensitive to it, is restless and peevish, but is surprisingly quieted by being carried about or from motion.

Gelsemium is for the more apathetic patient. None of the local symptoms are so marked. The exudate into the tympanum is mainly serous, and, if the tube will permit the passage of air, bubbles may be observed to form when Politzer's bag is used.

Ferrum phosphoricum is the remedy most frequently given in the acute stage before there is any apparent tympanic exudate. It is called the mineral Aconite, and it is indicated by the symptoms usually calling for Aconite. The patient is apathetic, depressed and anxious; there is general heat with fever more marked late in the day. The head feels full, dull and heavy; there are heat flushes, pulsations in the head and ears and sounds in the latter, which are variously described as rushing, roaring, buzzing, or humming. An examination of the ear will reveal a congestion along the malleus and Shrapnell's membrane, or even over the whole membrane. The meatus and canal, too, will show some hyperæmia and tenderness.

It is really wonderful how quickly and satisfactorily this remedy acts when given in the appropriate stage. Its indications are clinical, however, no proving having been made.

Hepar sulphuris is indicated by sharp pains in the ear, very severe all the time, but worse at night; inflammation of a high grade, aggravated by the least draught of air and relieved by heat and wrapping of the head.

It will frequently ward off impending suppuration.

Kali muriaticum has its special sphere of action in the clearing-up stage. It will do more towards returning the mucous membrane to a healthy state and prevent the consequences of inflammation than any other medicine.

Mercurius has a high grade of inflammation, with general tenderness about the canal and auricle. There is night aggravation, with excessive greasy perspiration, which does not seem to afford the patient any relief.

Pulsatilla has those symptoms which are very nearly common to all, such as deafness, pulsation and a rushing sound in the ears, but we are guided to its use by the fact that it acts best in people of fair complexion and sensitive nature who get some relief by being in the open air.

SUBACUTE CATARRHAL INFLAMMATION OF THE TYMPANUM

is either the acute form, which has been so modified by treatment that the severe symptoms do not develop, or it is one which, in subsiding from the acute form, has stopped short of resolution and yet is too active to be classed as chronic. A case which, when first observed, will deserve this diagnosis may shortly pass to another form, but quite a large number of cases remain for such a length of time in a subacute condition, not getting worse, but finally recovering by resolution, that the diagnosis as a separate one is warranted.

A *chronic catarrh* of the tympanum may also rise to a subacute condition under the influence of nasal obstruction or a naso-pharyngeal catarrh.

The symptoms are just those of *Eustachian catarrh* and are the same as accompany acute catarrh of the tympanum, except that *pain* and *fever are absent.*

The canal and membrane will be normal, except that there may be a *little hyperæmia* along the malleus and the membrane will be depressed.

All or any of the following symptoms may be present, viz., a sense of fulness in the ear, a diminished acuteness of hearing, buzzing or singing noises, the muffled sound of one's own voice in the ear, a cracking sound upon blowing the nose and perhaps just a twinge of pain once in a while.

Conditions like this may continue for from a week to two or three months.

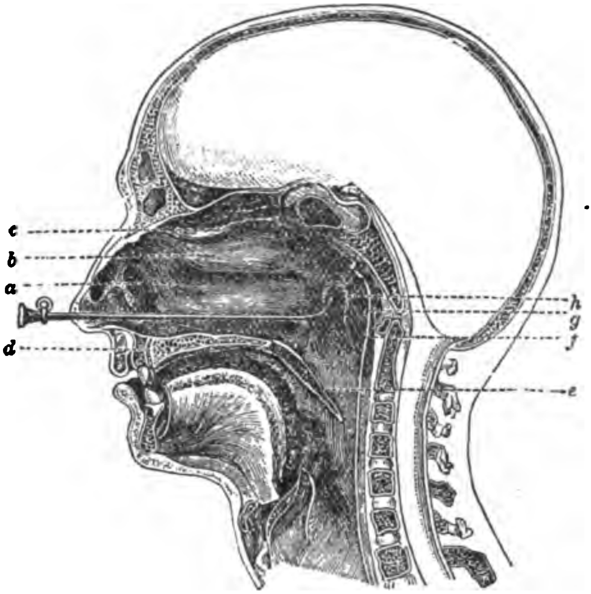

Fig. 29. Vertical section of the nasopharynx with the catheter introduced into the Eustachian tube. (After Politzer.)

a, inferior turbinated bone; *b*, middle turbinated bone; *c*, superior turbinated bone; *d*, hard palate; *e*, velum palati; *f*, posterior pharyngeal wall; *g*, Rosenmüller's cavity; *h*, posterior lip of the orifice of the Eustachian tube.

Treatment will restore normal hearing in all primary cases. and does not differ except as modified by the mildness of the symptoms from that for acute catarrh.

It is of prime importance that the naso-pharyngeal causes be properly and radically attended to. There may be an enlarged third tonsil, enlarged faucial tonsils, adenoids about the mouth of the tube, nasal polypoids or other obstructions which will yield only to surgical measures, and if this be so it should be discovered and quickly attended to.

The tympanum should be ventilated daily, or as often as needed, by Valsalva's or Politzer's method. Once a day is often enough, and if the former method is used the patient should be warned not to do it too often for fear the membrane will become stretched and inelastic.

Internal medication will depend much upon the *general* symptoms, and those remedies most apt to be needed are the same as are described under acute catarrh of the tympanum.

CHRONIC CATARRH OF THE MIDDLE EAR.

The characteristic symptoms of all those cases which come within this category are progressive deafness, various noises in the ears and an intact drum membrane.

If the portion of the ear behind the membrane could be carefully examined, it is likely that the pathological conditions now included under the above title would lead to a more numerous and exact classification. In the present state of knowledge, however, we are enabled to determine with considerable distinctness at least three groups having quite decided differences.

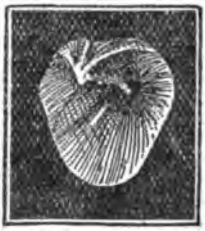

Fig. 30. Great concavity of the drum-head with a foreshortening of the handle of the malleus. (After Politzer.)

The first might be termed *chronic proliferous* or *hypertrophic catarrhal inflammation of the middle ear* and would be characterized by congestion and infiltration of the mucous membrane of the middle ear and nasopharynx. With this condition there would very probably be pharyngeal adenoids.

The second group would include such conditions as to warrant being termed *sclerosis of the tympanic mucous membrane.*

The special features of this class are a thin and very transparent drum-membrane, and a generally open Eustachian tube. The pharyngeal mucous membrane is usually pale, thin and smooth. In these cases the drum-membrane is not usually much retracted, and being very transparent it permits a view of the inner wall of the tympanum, which appears very white on account of the thinned and non-vascular condition of the mucous membrane covering the bone. From these patients it is common to get a history of previous naso-pharyngeal catarrh, and it would seem that the ear had partaken of the same hypertrophic inflammation. In this process there followed a great increase of the connective tissue elements, resulting in a crowding out of the glandular elements and reduction of the vascular supply to the mucous membrane.

The features of the *third group* are not so well marked. In fact, it is in this group that are included those cases in which it is impossible to discover a sufficient lesion to account for the patient's marked loss of hearing. The loss of hearing is evident enough, but not so the pathological changes responsible.

In post-mortem examinations of deaf persons whose cause of loss of hearing it was impossible to diagnose in life, it has been found in some, that the secondary tympanic membrane was thickened and contained calcareous deposits. In others the auditory nerve has been affected ; there has been anchylosis of the stapedio-vestibular joint, and even an intra-tympanic exostosis has been found.

None of these conditions could be discovered during life, and in case the drum membrane appeared healthy and the Eustuchian tube was permeable, some of them must be present, at least in a measure, if there be much deafness. Such conditions coexisting with an evident catarrhal state of the tympanum would explain those cases where the deafness is so out of proportion to the apparent defect in the drum membrane or Eustachian tube.

Symptoms.—In the *first group* it is unusual to see cases under eight or over forty-five years of age. The *second group* includes few under thirty years, but those belonging to the *third group* may be encountered after childhood at any age.

In all of those cases that fall within these
tories are very much the same, except that i
there is some exacerbation and remission of sy
The loss of hearing is generally quite gradual, o
stationary for months or years. It is rare that
results. Loss of hearing may be rapid at first a
or stationary for the balance of life.

In these cases it is not safe to promise any
ment of hearing except in some of the first gro
tion to the nose, the adenoids in the upper phary
gested Eustachian tube may yield satisfactory re

In the first group there is considerable post-na
a feeling and real condition of fulness. The me
and the mucous membrane lining the tympanu
opaque and thickened and the size of the chambe
of the tube reduced by just so much. These pati
in varying degrees according to the weather, the
their surroundings, or, if they use tobacco, to t
smoke. The chewing of tobacco does not seem
effect.

Most of the *symptoms of the second and third*
have already been mentioned. They have very
the nose or pharynx. The loss of hearing con
stant and subject to but slight variations and
symptom. There is apt to be tinnitus, howeve
and distressing and not infrequently excessive.

The membranes are thin, dry or transparent,
canal is large and its ceruminous glands inactive.

Post-mortem investigation has shown that in
are numerous connective tissue changes in the
as bands, adhesions, anchyloses, and exostoses.
degeneration of the muscle of the tensor tympa
may be adherent to the ossicula or walls of its

Etiology.—The causes are often difficult an
possible to discover. The patient may have so
herited or acquired, which prepares him for cat
tions. Affections of the nasopharynx, tubal cat
any condition which congests the tympanum or
help on to chronic catarrh of the middle ear.

Cases are occasionally seen where without any apparent cause or during pregnancy there is a sudden permanent partial loss of hearing. This leaves us to assume that there has been a partial loss of nervous function.

Treatment.—Every case must be considered by itself both as to discovering a cause and a plan of treatment.

No fixed plan for all cases of chronic catarrh can afford results which will be satisfactory. So it becomes necessary to inquire very carefully into the patient's family history, habits and the condition of their general health.

In the way of family history we may find syphilis, scrofula or gout or other morbid condition manifested strongly in several members or only slightly indicated in a few, and if it does not help us in the way of treatment it will certainly enable us to advise the patient in various ways to advantage.

By habits I refer to alcohol and tobacco, and also to such things as the proper wearing of clothes, underwear, shoes and rubbers in wet weather. Most young ladies fail to wear warm enough clothes. I think it is the exception to find wool next to the skin even in the winter season, and how common it is to hear them say that nothing could tempt or compel them to use rubbers. They " would infinitely rather have wet feet."

Recognizing as we do that if there was never anything but a normal condition of the nasopharynx there would be practically no catarrhal diseases of the ear, we must direct our attention to the cause and relief of naso-pharyngeal morbid conditions.

During the last few years various reflex causes of nasal and pharyngeal catarrh have been studied till we can no longer doubt the relationship existing between them.

A *lithæmic* or *gouty diathesis* is one of these, but we can not yet tell the exact way in which it acts. That it is through the sympathetic nervous system and the vasor-motor apparatus is easy to say, and doubtless true, but we do not know why, nor how, it is just so. It is well known that wet feet may cause a "cold in the head" through the same agencies, but we do not know just what path it takes from the feet to the pharynx nor why it should switch off at times to the bowels or stomach.

Mal-conditions of the uterine organs are said by some to occasion naso-pharyngeal catarrh. It is perhaps doubtful these causes would be effective if there were not alread latent or pre-existing mild catarrhal state, but in this climat is true that that state is very prevalent. So it becomes ne sary that these various conditions that may in a reflex mar cause or aggravate an existing state of nasal catarrh should recognized and attended to if we would follow chronic ca rhal inflammation to its source. We should, in proper ca insist on warmer undergarments, heavier shoes and rubbers w needed. In this way much can be done to stop the prog of the disease in cases belonging to the first group

If there is a spur on the septum nasi or an hypertro of a turbinated bone, bringing the mucous membranes of posite sides in contact, or so occluding the breathing space the patient must needs to breathe through the mouth in p then attention to this detail is the first requisite of treatm

The condition of the vault of the pharynx may be such a require frequent cleansing with a dilute Dobell's or other a line solution. Or if there be excessive adenoid growth solution of the silver nitrate, or their removal may be nee

Local treatment is imperatively demanded in some cases, I can see no reason why a homœopathic physician should ob to such in the throat, nose, or ear any more than he woul the use of such methods in a case of purulent ophthalmia. the same time all the symptoms of the case should be stu for the indicated internal remedy.

For the second and third group of cases very little ca done. Under careful treatment some of these cases seen hold what hearing they have better than without it, ar very few may improve either in hearing or by a lessenin the tinnitus.

Very many mechanical and instrumental methods have time to time been advocated, but none with such results a receive anything like general acceptance.

The nasal douche by means of a fountain syringe was a popular method of treating the nose and vault of the phar A solution used in this way would enter one nostril throu nose piece and pass around and make its exit through the o site one. Dr. Roosa showed, some years ago, that an a inflammation of the middle ear was occasionally set up by this method, the force of the water pressure being enough to cause it to enter the tympanum through the Eustachian tube. In these cases it is probable that the tube is too patent. In like manner the practice of snuffing a solution from the hollow of the hand has produced the same untoward result. When it is desirable to pass a solution into the nose, it can be done better and safer with the atomizer or spray apparatus. When it is desired to use a forcible method, the post-nasal syringe should be used. If it be remembered that the mouth of the Eustachian tube opens downward and forward, it will at once be apparent why force from behind is not apt to cause mischief with the middle ear.

Dr. Gruber advocated at one time the forcing of solutions into the tympanum by using a nasal douche in one nostril, the other being closed with the finger, and then having the patient perform Valsalva's experiment. The method is very little used, and is open to the objection to all fluids; that they are foreign bodies in the ear. Numbers of instruments have been put forward to dilate the Eustachian tube or inject solutions through it. A dilator can act only in the lower end of it, and very doubtfully then. The injections are open to the same objections as the douches. If there be any use for either, it can only be as a method of making applications about and within the mouth of the tube. Cases frequently present themselves where Valsalva's and Politzer's method are ineffectual to cause a renewal of atmospheric air in the tympanum, and the Eustachian catheter must be used if an immediate result is desired. This serves to dilate the lower end of the tube, and not infrequently it will be found that, after using it once, Politzer's method will then inflate the ear. In these cases the entrance has been occluded with granulations.

Air is the most important agent we can apply through the tube to the tympanum.

Fluids have been used through the catheter, but the method has not been generally adopted. In many cases the fluid does not reach the tympanum and there is great difficulty in knowing when it does reach it. Cures which have resulted under its use could not be attributed to the method alone. Further-more, it is not a safe method because it is impossible to how much of the fluid used passes into the tympanum its effect is beyond the control of the operator.

Vapors have been extensively used, such as iodine, chl form, steam, or ether, singly or combined, for the cure cases of the first group. Vapor of iodine or steam is pas in from a generator through a catheter, while chloroform ether is first taken into a Politzer's bag and caused to e the ear by its use in the ordinary way.

A great deal is claimed for these vapors by some, but it question if any better results are obtained with them.

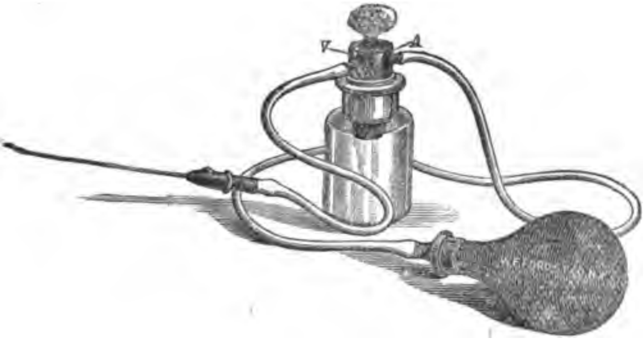

Fig. 31. Dench's vaporizer for the tympanum.

Bougies are used to dilate the Eustachian tube. They only be used in the lower portion in any case, and if taper enough to be useful then they are apt to enter the tissues. If air is then forced through it will cause emphys from which death has resulted in a number of cases.'

Electricity has not obtained a place in the treatmen the Eustachian tube, or through it to the tympanum. Th of electricity as a method of applying massage by sound w through the canal is mentioned elsewhere.

Gratifying results are claimed by some authorities fron use of the galvanic current in cases where the muscular t of the tympanum is degenerated.

Although persons suffering from this chronic catarrh are r free from evidences of its presence, there is in summer prol no advancement of the trouble. Treatment during this season should be discontinued and applied most vigorously in the spring, fall and perhaps winter.

These cases can expect nothing but to retrograde if they are without treatment during some portion of the year. The laity must wake up to the fact that the time to treat these cases is in their very earliest stages, in childhood often, when there is mouth breathing, earache and general catarrhal conditions of the air passages, and not twenty years after deafness is observed, as is so often the case.

Physicians, too, must press this point upon parents who bring their children for these affections. The people must quit the idea that magic ear-drops are all-powerful for whatever may be wrong with their ears.

Many surgical methods of relief have been from time to time advocated to be used upon the membrana tympani or within the tympanum, but they are fraught with many difficulties and have attained no positive standing in the treatment of chronic catarrh.

Over a century ago paracentesis of the membrane was made for the relief of deafness, because it was observed that many persons who had lost this tissue were in possession of better hearing than those in whom it was intact but sclerosed. It soon fell into disrepute, because it caused many cases of chronic suppuration and resulted in some deaths. As a method of relief in acute cases it has continued. The opening made was found to close quickly and Politzer for a time suggested the insertion of an *eyelet* of *bone* or *ivory*. Voltolini made openings with a cautery puncture which remained permanent for a little longer period of time, but would finally close.

The eyelet was very difficult to place; it frequently caused suppuration, and in one case dropped into the typanum and produced a violent inflammation before it was recovered.

The *cautery puncture* is not permanent, and in healing causes cicatricial tissues and probably more adhesions than previously existed.

Large triangular sections of the membrane have been excised, but hæmorrhage makes it a trying operation and prolonged suppuration usually follows. The result is very uncertain.

The operation of Weber-Liel, dividing the tendon of the tensor tympani, had good physiological reasons to recommend it, for tinnitus should be less if the ossicles, relieved of the indragging of this muscle, do not press upon the labyrinth. There is great lack of uniformity in the results, however. Some have operated for the division of adhesions between the walls and ossicles. but our most approved methods fail to locate them with any degree of certainty; otherwise this would be an excellent procedure.

No success has followed the removal of the malleus, its handle, the other bones, or portions of them. The object of these various operative procedures has been the relief of the labyrinth from pressure or the removal of obstructions, preventing sound waves from reaching it; but the results have been such that they are nearly if not quite abandoned, especially in this country.

Tinnitus and that feeling of fulness or stuffiness in the ears so distressing to the patient can frequently be relieved or much reduced by the use of Siegel's otoscope, connected with an exhaust pump, or by other methods of pneumo-massage. Used in this way it improves the circulation within the tympanum while applying massage to it and the various adhesions that may be existing. See the section on Subjective Sounds.

HOMŒOPATHIC REMEDIES:

Agaricus is useful in the hypertrophic form of disease when there is a feeling, or a real condition of twitching of the upper pharyngeal muscles, or of those of the tympanum. There is a rattling and creaking sound in the ear with the act of swallowing.

Arsenicum album.—In subacute exacerbation of the hypertrophic form, with naso-pharyngeal symptoms of fulness and occlusion of the tube.

Baryta muriatica.—Severe buzzing in the ears. Cracking sound when swallowing. Reverberation in the ear on blowing the nose. Aggravation in damp weather. Claimed to be of special usefulness in cases of abnormally open Eustachian tube.

Belladonna.—May be indicated in subacute exacerbations, the special symptoms to be found outside of the ear. The pharynx is bright red and dry. Ringing noise in the ears. Intolerance of all noises.

Calcarea carbonica.—Only of use if the appropriate general symptoms are also present. Over-grown children; large abdomen and head, fat and with soft bones. In adults who as children were fair and vigorous and later show a low power of assimilation, are weak, and sensitive to cold and damp air. Apt to sweat about the head at night. Loud sounds in the ears and with pains, if any, of a pulsating character.

Calcarea phosphorica may present much the same symptoms, but is limited to children, particularly if there be disease of the bones and lymphatic system.

Carbo vegetabilis.—Ringing noise in the ears, in persons of low vitality and an exhausted nervous system. Apt to have an excessive accumulation of gas in the stomach and abdomen. Useful in children after exhausting diseases.

Causticum.—Noises in the ears. Words and steps re-echo in the ear. Feeling as of an insect crawling in the ear. Aggravation in the evening and patient subject to rheumatic inflammation and laryngeal catarrh.

China.—For the proliferous form of inflammation with high-pitched tinnitus. Drum-membrane dull-red, and thickened. Neuralgic pains of an intermittent type. Tinnitus and pale condition of drum-membrane following hæmorrhage.

Ferrum phosphoricum.—In subacute exacerbations with considerable pain and throbbing in the ear. Sensitive to touch.

Gelsemium will be seldom thought of. Sudden and transient lost of hearing with a rushing sound in the ears.

Graphites.—Hearing is improved when the patient is in a noisy place. In the sclerotic form of disease. Eustachian tube may be easily opened and the membrane freely movable, but hearing is not improved thereby.

Hydrastis canadensis.—For the ear condition which may occur with its characteristic symptoms elsewhere, and particularly in the nasopharynx. Thick, tenacious, and ropy secretions. Dull frontal headache.

Iodine.—In the dry catarrhal condition similar to Graphites.

Kali hydriodicum.—In the chronic proliferous form, with burning and scraping in the throat. Stringy and salty expectoration. Cases with a specific history.

Kali muriaticum is perhaps the most generally used remedy in the proliferous form. The indications are clinical. There is no pain, but deafness, subjective sounds and a sense of fulness in the ears. There is a closed Eustachian tube and retracted drum-membrane. This remedy certainly helps many cases.

Mercurius dulcis.—This drug is used in the same cases as Kali muriaticum, and does equally good work. The symptoms are the same. In the throat, however, we expect to find a granular and hypertrophic condition of the mucous membrane. Tinnitus becomes worse with each fresh cold. (*Mercurius vivus.*)

Mercurius protoiodide.—Proliferous form of middle-ear diseases, with thick and indurated faucial tissues, tonsils enlarged and frequently inflamed. The proving indicates a special affinity for the right side.

Mezereum is useful when you get its peculiar symptom, which is that the canal feels too open, allowing the cold air to blow into the ear.

Phosphorus.—In the dry form of chronic catarrh. Deafness and tinnitus worse when lying down. Difficult hearing, especially for the human voice. Nervous women who have rush of blood to the head.

Phosphoric acid.—Deafness, with roaring in ears. Sounds re-echo in the ears. Intolerance of noise, especially music. In patients with exhausted and depressed nervous system.

Sanguinaria canadensis.—Great sensitiveness to sudden noises, especially in persons subject to rush of blood to the head, vertigo, and sick headaches.

Teucrium marum verum.—Is most apt to be indicated in the subacute inflammation when there is very little pain. A feeling as if air passed into the tympanum through mucus, causing a muffling of all sounds temporarily. Where the actual presence of mucus in the tympanum can be made out.

ACUTE PURULENT INFLAMMATION OF THE MIDDLE EAR.

Etiology.—Both forms of acute inflammation of the middle ear, the catarrrhal and the purulent, have their origin in or follow an inflammation of the nasopharynx in the great majority of cases, and extend along the Eustachian tube. Rarely it may be that in scarlet fever and smallpox the primary inflammation peculiar to these diseases may develop within the tympanum. As a rule, however, in all these cases the aural symptoms have been preceded by nasal or pharyngeal diseased conditions.

Any of the exanthematous diseases may cause or be complicated by an acute purulent inflammation of one or both middle ears, and in the order of greatest liability they range as follows: Scarlet fever, measles, smallpox, typhoid fever and cerebro-spinal meningitis.

Frequently no better, or, perhaps I should say, more severe cause, can be found than an acute "cold in the head." Sudden concussion, a fall, a blow, sea bathing or a sudden congestion as a heat prostration may be a cause. So also can it develop from nasal douches, middle ear injections or paracentesis of the drum membrane. Some German authorities claim that occasionally it is a result of extension from an inflammation of the cerebral meninges.

Pathology.—The changes observed in the drum-membrane are the same as those described under the acute catarrhal form of disease, except that on reaching its maximum the latter subsides gradually, while in the purulent form there are still further advances of inflammation before resolution commences. These further changes in the membrane take a variety of forms, some present in all cases, but all probably never present in any one case.

The blood-supply of the membrane is best in Shrapnell's segment, and here the congestion is most severe during inflammatory stasis. Serum from osmosis lifts its anterior layers to form a bleb or sac, and this may be seen as a pearl-colored tumor in the upper part of the membrane close to the short process. If, as is generally the case, there has been a rupture of a vessel, then the cyst may be any color from light to purp These cysts are not often very large, but may grow from seed size to an extent limited only by the inner end canal.

Another condition nearly always present in acute ca due to the fluid exudation within the tympanum, is a bu the drum membrane in its posterior segment. This will, cases, occur earlier than in others, and if it be late it ma easily discovered, because by that time the walls of the c the membrane may be so infiltrated with inflammatory that the bulging will be difficult to recognize. This in of the membrane may occur with, just prior to, or just bulging, and mainly affects the outer or dermal layer.

At first the surface becomes dull and the reflex of obscured, then opaque, and whitish, accompanied by an tion of serum on the free surface of the drum membrane a little cotton on a probe the moist surface can b demonstrated, and in the same way the softened and so dermis will be seen to come away in small flakes or This stage may last from a few hours to a couple of d during it the whitish condition of the dermal layer the high grade of inflammation within the tympanu moderately hard mopping with cotton, or by using probe, the softened epidermis can be removed over sufficient to show the real condition below. The invo of the epidermis at the lower end of the canal in this of exudation and softening is easily appreciated if t anastomoses of the part is borne in mind. In very seve the swelling nearly closes the canal.

At about this period, if the case progresses, the me pressed upon by the increasing fluid within, and weak the infiltration of its layers and the loss of a part of dermis, ruptures at its weakest point. This perforation in any part of the drum membrane and is generally s if the suppuration continue, and especially after the ex atous diseases, it may increase materially in size, eve total destruction of the membrane. The pus immediatel from the tympanum, pain is relieved and a discharge est into the canal.

It should be remembered that there is a wide range between the mild and severe cases of purulent middle ear disease. The patient should be closely observed during the whole course of the disease, for it is reasonable to believe that the cells of the mastoid are more or less inflamed in all cases. Then, too, there is an anastomosis between the vessels of the tympanum and the cerebral meninges, through the bony roof of the former, which, according to some authorities, is responsible for *a local meningitis in all severe cases.*

Even though most of these cases terminate favorably after a few days of discharging of pus, they should all be regarded as serious until such a result is clearly evident.

Symptoms.—Up to the point of pus formation the symptoms are like those described for acute catarrh, but occasionally in children there is so little pain that no thought is had of the child's ear being diseased till it begins to discharge pus. The other extreme is also found when the symptoms are so severe and violent as to suggest meningeal disease. It is proper, then, for every physician having a suspected case of intracranial trouble to examine the ears.

Diagnosis.—When a perforation has not occurred it may be impossible to differentiate from an acute catarrh, but when a purulent or muco-purulent fluid is found in the meatus and a perforation is seen in the membrane which yields a whistling sound upon politzerization then the diagnosis is positive.

Treatment.—Before a perforation resulting from nature's methods or at the hands of the surgeon occurs, there will be no need of other treatment than that directed for the acute catarrhal form.

If a perforation exists and pain still continues, it may be that the opening is too small for free drainage. The membrane then should be slit down from the opening to the floor of the canal. This will allow free escape of secretions and thorough cleansing and disinfecting of the tympanum. Such an extension of the perforation is not painful if a 20 per cent. solution of cocaine is allowed to remain in the canal for about five minutes before cutting. This new opening is very apt to close in a few days and may need repeating. Some cases display such rapid healing of the new opening, even after numerous cuttings, that it is sometimes better to make two diverging incisions perforation downward. All discharges should be wi with cotton twisted on a small flexible cotton carrier should be firmly twisted on the carrier, but should h tuft at the end, and if the operator is not skillful w will be better to use a pint or so of warm water under ure to *syringe the discharges away.*

The use of the Politzer bag will cause any pus in panum to pass to the canal.

All discharges having been cleaned away, inject canal a few drops of formalin, 1–1000 to 1–3000 sol apply a little air pressure with Siegel's otoscope Politzer's bag, the nozzle of which will be, in this firmly at the external meatus.

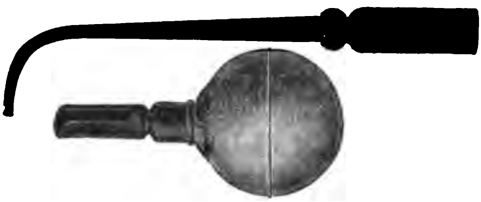

Fig. 32. Powder blower.

Again wipe away any excess of fluid, blow in a lit powder and lightly plug the canal. Powdered boric better application after the acute stage. No kind o should be packed into the canal, because if used quantity it cakes and prevents the escape of dischar ear should be left as dry as possible, for with moisture it presents a very favorable field for the de of bacteria. The cotton plug protects the sensitive cold and draughts and soaks up the discharges. The solution is one of the most powerful germicides, a forced through the perforation in the manner describe into contact with the pus-producing surfaces. To the dangers of retained discharges, it is only necessa member that practically they never escape through tachian canal, and as they must have a vent there onl the mastoid antrum and cells.

As stated before, the pain usually subsides after perforation, but in case it continues relief may be afforded by a 10 per cent. solution of carbolic acid in glycerine. This reduces the congestion of the vessels and anæsthetizes the tissues without cauterization.

Internal remedies may be given on both their general and local symptoms. The following are some of the mostly frequently used:

HOMŒOPATHIC REMEDIES:

Arsenicum album.—The patient is weak and exhausted, has frequent thirst and all symptoms are aggravated after midnight. The discharges are thin and excoriating. The external canal is red and tender.

Aurum.—A bruised and sore feeling in the ear. The bone or periosteum becomes involved in the disease. Foul odor. Specific history. Aggravated by rest and uncovering and better from motion, covering and going into open air, and yet sensitive to cold air.

Bryonia alba.—Sensitive, red, hot, swollen and painful external ear. Membrana tympani soaked and sodden. Profuse watery discharge.

Calcarea carbonica.—With the general symptoms as given under acute catarrh, together with the presence of viscid discharge, bad odor and tendency to the formation of granulations.

Capsicum.—Suppurative inflammation, the key-note to the drug being a sensitive mastoid with red or *bright red inflamed area over the mastoid process.*

Calcarea phosphorica.—With a general calcarea picture and without special indications.

Chamomilla.—The patient irritable if an adult and peevish if a child. The pains seem absolutely intolerable, are aggravated by warmth and at night.

Elaps corrallinus.—Offensive and yellowish discharge. Frontal and occipital headache aggravated by motion and stooping. Especially in mouth-breathing children, with naso-pharyngeal catarrh.

Ferrum phosphoricum.—Severe throbbing pain, aggravated at night. External ear sensitive to touch. Pain and fever following exposure.

Hepar sulphuris.—Useful in every inflammation before or after suppuration develops if certain symptoms are prominent, such as, great sensitiveness to touch, shrinks from the gentlest manipulations, complains how severely he is hurt. Must have the ear wrapped up, cannot tolerate the least draught.

Hydrastis canadensis.—Muco-purulent, thick, tenacious discharges. Dull frontal headache, stringy naso-pharyngeal catarrh.

Kali bichromicum.—Very similar symptoms to Hydrastis, the differentiation being that the discharges are so ductile that they can be drawn out in long strings.

Magnesium phosphoricum.—Threatened suppuration with marked neuralgic symptoms.

Pulsatilla.—Acute inflammation, impending and real suppuration, symptoms not of the greatest severity. Especially useful in children. Fever without thirst. Aggravation in the evening. Is better, or feels as if he would be better, in the open air. Pain, deafness and noise in the ears. Nose stopped up.

CHRONIC SUPPURATIVE INFLAMMATIONS OF THE MIDDLE EAR.

This is quite a common sequel to acute suppuration, and, while always reducing the patient's hearing power, is not an infrequent cause of death through its extension to other structures, as already described. Every teacher and writer upon this subject has of late sounded a warning to the danger lurking in this disease, but still we find the people and many careless or ignorant physicians heedless of the risk and advising that it be left alone till the child outgrows it.

Every physician should advise treatment, for the disease does not tend to resolution, but toward a destruction of tissue.

Pathology.—There is of course a perforation in the drum head, most frequently in the lower posterior or anterior quadrant, and generally quite large if the case is of long standing. The whole structure of the tympanum is in the main involved, the mucous membrane being hypertrophied and of a wash-leather or reddish color. Where the perforation is very large, so as to include practically the whole drum-head, it is usual to find an edging of membrane still left around the margin below, and at the sides, and the membrana flaccida is seldom destroyed. At the margins, what membrane there is remaining may appear like a ridge or rim of tough tissue. Through such an opening a good view can be had of the inner wall, including the long process of the incus and occasionally the stapes.

In most cases, however, there is such a degree of hypertrophy and development of new tissue, if of long standing, that the ordinary appearance is obliterated and even the incus may not be recognizable.

The long process of the malleus will be observed free of any membrane, or having a little fringe along its upper half. Indeed, on occasions, the short process is about the only point to made out distinctly.

Necrosis of the ossicles is not infrequent, and the incus is most frequently the first one attacked on account of its smaller supply of nourishment. When the perforation exists above the short process of the malleus, it will be readily seen that the opening being so high up the drainage must be poor, and in most cases there is a necrosis of this bone. Repair of a fairly large perforation in chronic suppuration may occur, but in most cases an opening remains.

When most of the membrane has sloughed away there is, in the process of healing, an extension of epidermis inward over the former mucous membrane, so that the inner wall of the tympanum may be covered with skin. An involvement of the labyrinth is less frequent than extension to the mastoid.

Etiology.—As this affection is but an extension of the acute form, it is unnecessary to add to what has already been stated except to say that a debilitated, tubercular or syphilitic condition predisposes a patient to its ravages.

Symptomatology.—There must be a discharge of pus through a perforation in the drum-membrane. The amount may vary between wide limits, from very thin and copious to a drop or so of thick and foul-smelling matter which cakes and crusts over the perforation or on the walls of the canal.

When on the walls these crusts tend to work toward the external meatus, where they cause considerable itching. Hearing is somewhat reduced, but usually not seriously im and deafness is an infrequent occurrence. Sclerosis with tact membrane is much more destructive of hearing. 7 *is not common.*

In an ear fairly active in pus-production and neg granulations often form along the edge of the opening the exposed infra-tympanic mucous membrane. These all sizes, bleed very easily and fill the lower end of the ca

One or more polypi may grow from the perforatio having smooth or cauliflower surfaces. A polypus may fill, and extend beyond, the mouth of the canal. A m amount of pus usually exudes around its edges. The col polypus extending out of the canal may be quite purple, s that its size presses upon its blood supply. Usually b polypus and granulations are bright-red. If not bat much pus and if unirritated, the color of the polypus is quite pale.

Both granulations and polypi are strong evidence of a bone, and if such be present it is generally accompani a foul odor. A fine probe may discover the point of dea

Involvement of the labyrinth is very rare, and woul once detected by the sudden vertigo, nausea and deafnes it causes. If the facial nerve becomes involved, or whe is much pressure and the external wall of the aqu Fallopii is necrosed, there will be facial paralysis.

Prognosis.—Good results are to be expected with treatment. Otherwise the tendency is to destruction o and as the mucous membrane and bone are so intimate a will result in neglected cases. A false sense of sec fostered when the discharge is too slight to escape from The disease, however, goes on just the same.

SYPHILITIC LESIONS OF THE MIDDLE EAR.—In s patients with the syphilitic sore throat it is not uncom find one or both middle ears involved. In most cases the subacute catarrhal form of inflammation, with a swollen drum-head, but without signs of bulging. T jective symptoms, too, are not different from non-specifi

In some rare cases, however, there are seen path changes which are quite like those that occur in th and soft palate, and, therefore, may be classed as special manifestations of syphilis. These changes consist in a practically painless development of a *perforation by necrosis* of the tissues of the membrane. The parts are of a bright-red color and the perforation is apt to be extensive, and, perhaps, multiple.

Antisyphilitic treatment may cut short the process and healing may be quite perfect, but the result for hearing is not so favorable as in non-syphilitic inflammation. A lesion of this kind, while rare even in acquired syphilis, is still more so in the inherited form. The relatively unfavorable result as to hearing is supposed to be due to a coincident local periostitis of the inner wall of the cochlea or of the stapedio-vestibular joint.

TUBERCULAR LESIONS OF THE MIDDLE EAR.—In hospital practice, among the ill-nourished and more exposed poorer class of patients, tuberculosis plays quite a part in middle ear diseases. It is only possible to make sure of a tubercular origin, in what is otherwise quite like an ordinary subacute inflammation, except in the early stages of the disease. On this account probably many cases fail of a proper diagnosis.

Pain is nearly, if not entirely, absent. There is slight deafness, some feeling of fulness, and moderate tinnitus in the early stages. The symptoms are so slight that most patients would fail to seek advice.

Congestion and infiltration starts, usually, in the posterior superior quadrant and the wall of the canal in the immediate vicinity and spreads to involve the rest of the membrane. Gradually, and without pain, the inflammation focuses; generally in the upper part of the membrane a prominent spot develops which becomes more bulging, and then it breaks down and a perforation forms. The color of the inflamed tissues is not apt to be as red as in the syphilitic form. The discharge may be slight or thick and profuse.

If, in the progress of healing, any obstruction to the free escape of pus should be formed, the pain may become very severe. Hearing after recovery is usually impaired. These patients usually manifest great intolerance of manipulation.

The development or recognition of other tubercular lesions in the patient is of great aid in diagnosis.

Treatment of Chronic Suppuration of the Middle Ear.—Cleanliness is the key-note of treatment. Cleanliness should be repeated and insisted upon and re-stated time and again. I believe that the first treatment should be to syringe the ear with a warm bichloride solution, 1–4000, and use a large amount of it. Only in this way can the canal be cleaned of the crusts, flakes of hardened pus and broken down exfoliated epidermis.

The continuous flow syringe is rather better than the hand variety. When doing this the patient should pack a towel about the neck and hold a suitably-shaped vessel against the neck just below the ear to catch the return flow. The canal should then be wiped out with cotton and freed of any detritus, which is often partially attached just within the mouth of the canal. Any remaining secretion should now be forced from the Eustachian tube and middle ear into the canal by using the air bag and then cleaned away. When the parts are dry, and, following the dry method, many cases will be found doing well under a dusting of powdered boric acid. I have found Aristol alone, or half and half with boric acid, to act rather better, however, on account of its antiseptic, anæsthetic and well-known cicatrizant properties.

If there be a small perforation, and if caries be suspected on account of granulations, a solution of formalin, 1–500, used in the following way will do good service:

Let the patient's head be inclined to one side and several drops of the solution instilled into the canal. Then fit tightly into the external meatus the nozzle of an air bag, and make considerable pressure. This procedure forces the solution into all parts of the tympanum, and in suitable cases through the Eustachian tube. Let the solution remain for about five minutes and then dry the canal with cotton.

When granulations are in plain sight, I find it well, before using other treatment, to cauterize them. When doing this the surfaces should be as nearly dry as they can be made. Twist the least little bit of cotton on the probe and moisten its tip with pure carbolic, trichloracetic, or chromic acid, and touch the exact spot that needs the cautery. Never use enough acid to permit it to run indiscriminately over other parts. At the New

York Ophthalmic Hospital a saturated solution of bichromate of potash has served well when the granulations were general.

In cases where the granulations are not extensive they may be treated with a solution of alcohol, full strength or dilute, as indicated by amount of pain caused by its use. Such a solution should be used after thorough cleansing and retained for several minutes. Its effect is to blanch, shrink and atrophy the little masses.

Extensive granulations should be curetted after anæsthesia has been produced by a warm 20 per cent. solution of cocaine.

A saturated aqueous solution of carbolic acid, applied with a cotton probe just where it is wanted, has a good effect upon pus-producing tissues.

After the solution of formalin treatment has been used for several days, if the pus secretion is less, it is well followed by the dry treatment, or by simply cleaning and drying the canal.

The patient should be treated at least every second day. The results obtained by careful and painstaking methods are frequently surprising.

Many other remedies have from time to time been in high favor, but are not now much used. Among them may be mentioned *iodoform*, *solution of silver nitrate*, *zinc sulphate*, *salicylic acid powder*, *europhen*, *pyoktanin* and *protonuclein*. Some of these are offensive in various ways, as the iodoform for its odor, and nitrate of silver and pyoktanin for their stains, and others have not proven useful. In cases where the perforation is very small and the discharges through it are persistent it must be enlarged as described in a preceding section.

Another great cleaner and pus destroyer is the *dioxide of hydrogen* (H_2O_2). The free oxygen given off in the presence of pus destroys bacteria and by its effervescence penetrates to the attic and every inaccessible part of the tympanum, dislodging and bringing to the surface débris which might even escape the syringe. When using this the patient's head must be inclined to one side and the solution retained for several minutes. When Politzerization is suspected of not clearing the tympanum of discharges or inspissated pus, the reverse action, suction, of a syringe with a soft rubber-covered tip to fit the external meatus may succeed.

HOMŒOPATHIC REMEDIES:

In this disease, as in so many others, the symptoms
the ear and the character of the discharges will be
alike for a number of drugs that it becomes necessary
always necessary in all good prescribing, to look to the a
structures and the general condition of the patient t

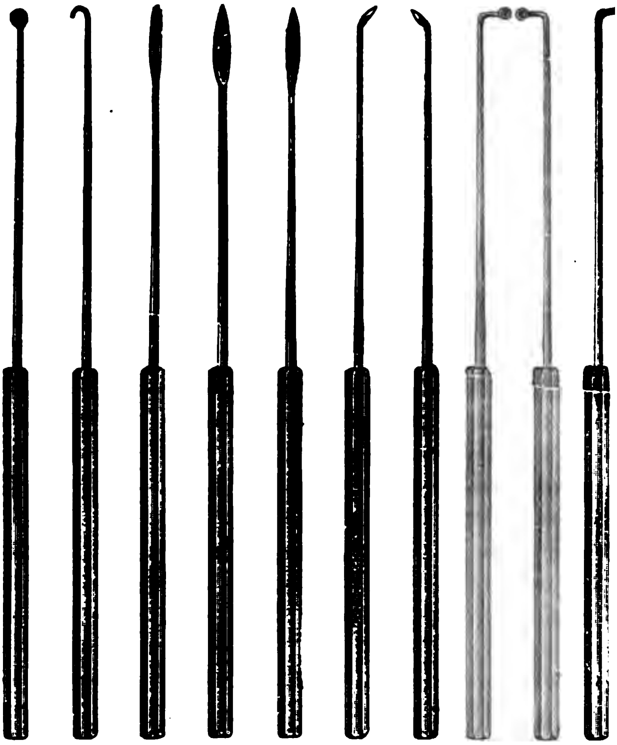

Fig. 33. Set of middle ear instruments with a flexible sha

nearly as possible, the "whole picture" of the indicated

Alumina.—Chronic suppuration. Granulations whi
easily. Discharge is offensive and excoriating. Itchi
down in the ear, which is made worse by attempts to r

Ulcerative nasal catarrh with a discharge of a thic
and blood-stained mucus.

Arsenicum album.—Dry and scaly, or pustular eczema of the meatus with ichorous discharge. The discharge from the tympanum is thin, ichorous and bloody. We may expect to find either dryness of the nasal passages or a thin, watery, and acrid discharge from the nose which makes its tip and the upper lip red, scaly and hot.

Asafœtida.—Chronic suppuration with necrosis of the bony walls. Thin, ichorous and foul-smelling discharge.

Aurum metallicum.—Otorrhœa with scanty, excoriating and offensive pus. Caries of the bone. Syphilitic and cachectic subjects, with suicidal melancholia. Useful when its indications come out from the abuse of mercury. Pain as from a bruise, worse at night.

Calcarea carbonica.—Chronic suppuration, in fair, fat and flabby children with a thick, yellow and bland discharge. Moist eruption behind the ear.

Calcarea iodide.—Similar patients with a thin and excoriating discharge. Enlarged cervical glands and an hypertrophic nasal catarrh.

Calcarea phosphorica.—For weak, anæmic and delicate children, with a thin and excoriating discharge. Granulations in the ear which bleed easily. The ear is hot, red, sore and swollen. Aggravation at night and by heat or cold. Useful in the later stages or after wasting diseases.

Capsicum.—A red and shiny mastoid process which is exceedingly tender to the touch. Tearing pains and aching in the ears. Itching pain deep in the ears. These symptoms indicate an acute condition, and when seen in the course of a chronic suppuration would indicate an involvement of the mastoid region, at least a periostitis. When caries and pus formation are established, the stage of inflammation for which capsicum is useful has passed. When the mastoid presents the key-note symptoms of bright-red, swollen and tender tissue, in any inflammation of the ear, this is the one remedy for it.

China.—Pain and a feeling of pressure in the ears. Ringing and throbbing in the ears, vertigo and throbbing headache. Chronic suppuration and granulations which bleed freely and easily. Old cases of an indolent character.

Elaps corallinus.—In children with a moderately irritating thin, offensive, yellowish-green discharge. Frontal and occipital headache, aggravated by motion and stooping. Mouth-breathers.

Ferrum phosphoricum.—When in the course of a chronic suppuration the ear becomes painful, and the patient has fever, as a result of exposure to inclement weather. There is a throbbing pain and the ear is sensitive to the touch.

Hepar sulphuris.—Chronic discharge of a fetid pus. Great sensitiveness to touch. Shrinks from even the gentlest manipulation. Complains how severely he is hurt. There is relief from warm applications and wrappings about the head and affected ear. Cannot tolerate the least draught.

Hydrastis canadensis.—Bland discharge. Thick, tenacious and muco-purulent. Dull frontal headache. Stringy and yellowish naso-pharyngeal catarrh.

Iodine.—Otorrhœa with a thin and excoriating discharge. Induration of the lymphatics in front of the tragus.

Kali bichromicum.—Inflammation of the meatus without severe pain. Sensation as of outward pressure within the ears. Stitching pains in various parts of the ear and mastoid. Thick, yellow and ropy discharge. Ulceration and granulations, with a sharp sticking pain. In a saturated solution it causes a shrinking of granulations when locally applied. When used in this way it should be applied just where it is needed, and not all over the canal. The 3x trituration of this drug and boric acid in equal parts make an excellent dusting powder in cases of indolent ulceration with the characteristic discharge, or when there are sluggish granulations.

Kali hydriodicum.—Discharge is yellow, and often blood-streaked. Severe tearing pains in the ear and mastoid. Aggravation at night.

Kali phosphoricum.—Dark-colored, thick, grumous and offensive discharge. The canal is inflamed from the discharges, and, when cleaned of pus, shows a rough surface covered with small and easily bleeding granulations.

Kali muriaticum.—Long standing suppuration, with increasing deafness. Excessive granulations, which recur when treatment is temporarily suspended.

Kali sulphuricum.—Long standing cases, with a thin yellow discharge.

Lycopodium.—In chronic and sluggish suppuration. Symptoms like Hepar, but without its great sensitiveness. Scrofulous subjects with moist eruptions behind the ears. In women, at the menopause, with rush of blood to the head.

Mercurius vivus.—Chronic suppuration. Discharge does not flow freely, is excoriating to the canal and has a coppery odor. Pulsating sound in the ear. Pulsation of the pus as it escapes through a small perforation in the membrana flaccida. Pain is dull and constant, but worse at night. Patient catches cold easily and the ear becomes painful on account of a checking of the discharge. The cervical glands are enlarged and sensitive. The tongue is thick and flabby and takes the imprint of the teeth at the edges.

Mezereum.—*Sensation as if air were distending the external meatus.* Chronic otorrhœa, with the development of crusts at the external meatus, under which is a thick and sticky discharge. Moist, itching, and obstinate eruption behind the ears.

Petroleum.—Inflammation and painful swelling of the meatus. Moist eczema behind the ears. Chronic suppuration in patients prone to eczematous inflammations.

Psorinum.—In children, either thin and marasmic, or fat and lymphatic, who have eczematous conditions of the ear and other parts of the body. Fetid, disgusting, and foul-smelling discharges which cake and crust about the meatus. The child is constantly picking at the ears. This remedy most certainly produces results and should be used in the high potencies.

Silicea.—Itching in the ears. Offensive and ichorous pus; caries of the bone. Children dig at the ears while asleep and cause them to bleed. They *enjoy* having their ears cleaned. Useful also in the late stages of chronic suppuration, when the discharge is scanty and from a small spot over which a scab forms. Perforations seem to repair under this remedy.

Sulphur.—Violent itching in the ears. Discharge of offensive sour-smelling, and bloody pus. Efforts at relief cause pain. Aversion to water, locally and generally.

Syphilinum.—In cases very like Psorinum. Excoriating discharges, causing a pustular eczema of the meatus, concha, lobule, and even out on the cheek. Similar affections in other parts of the body, especially about the eyelids. Painless syphilides on the fingers. Syphilitic history in the parents. Of this remedy, also, it must be said that it produces results, and in the high potencies.

Tellurium.—With symptoms also like Psorinum as to the discharges, the keynote being an odor like decaying fish brine. Thin, watery, and scalding discharges.

Thuja occidentalis.—Thin, watery, purulent otorrhœa, smelling like putrid meat. Would be indicated locally and internally if there were warty growths in the auditory canal.

DISEASES OF THE MIDDLE EAR, CONCLUDED.

SEQUELS OF SUPPURATION.

POLYPI.—No effective treatment can be had against suppuration in old cases until any existing polypi are removed. The size and location of the polypus will indicate whether the polypus-forceps or wire snare shall be used. When undertaken, the removal should be complete as possible, leaving only the pedicle attachment to be cauterized under cocaine anæsthesia.

More skill is necessary in the use of the snare than the forceps. Bleeding will soon stop under pressure of a pledget of cotton to the offending spot.

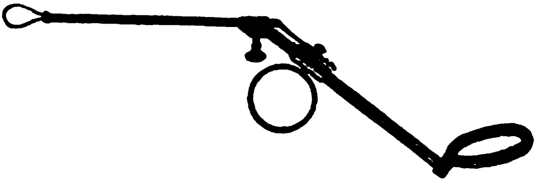

Fig. 34. Wilde's polyp snare.

The fused crystals of chromic acid make an excellent cautery. A few crystals are caused to adhere to the tip of an applicator and held in the heat of a flame till fused, then cooled a little and applied at the desired point.

A polypus is very apt to grow from the old attachment unless it is well cauterized. The after-treatment must be frequent.

If there be a very bad odor, and the polyp grows from a perforation in Shrapnell's membrane, and the discharge continues to be bloody, it is good evidence of necrosed bone, perhaps of the incus, or of the wall of the tympanum.

CARIES AND NECROSIS IN THE MIDDLE EAR.

It is by no means easy to diagnose positively this condition, but if, after scrupulous cleanliness in treatment, there persists a foul odor it is a diagnostic symptom second only to feeling the dead bone with a probe. Dead bone acts as a foreign body, and suppuration cannot be stopped till the necrotic process ceases.

When, under treatment, the foul odor ceases it is a good indication that necrosis has also stopped.

The first step in caries is the destruction of a portion of the tympanic periosteum. The first *treatment* is the same as that directed for chronic suppuration. Iodoform acts well in most of these cases, and, in order that it may reach the recesses of the attic and tympanum, it is best to use an alcoholic solution, and, since alcohol in a tender ear causes pain, it is well to first use something in the way of a local anæsthetic. Better in this condition than the 20 per cent. solution of cocaine is a 10 per cent. solution of carbolic acid in glycerine. This should remain several minutes and be wiped away. A saturated solution of iodoform in alcohol should replace it and be permitted to remain an equal length of time. The iodoform in this solution penetrates deeply, and if borne well frequently does much good. Should treatment fail, it may be necessary to remove the incus and perhaps the malleus.

This operation, and that for caries affecting the attic, will be described elsewhere.

NECROSIS OF THE OSSICLES.

In old cases of suppuration, one or more of the os
be lost before the patient applies for treatment, the a
the first to yield. When present and necrosed they h
to be of use, and remain only as a source of continu
mation. They should be removed to allow freer ex
treatment, and escape of discharges. Such remova
further impair hearing if skillfully performed, but
conserve it.

PERFORATIONS OF THE MEMBRANA TYMPA

Small perforations are apt to close, and may leav
of their existence, or there may remain a lighter-cc
showing the connective tissue formation. When l
generally remain open, the edges become thickened a
with a continuation of epidermis.

No treatment is required, because the mucous
becomes habituated to the presence of air like oth
membrane surfaces naturally open to the air. The hea
quently better with the perforation, because the sou
have direct access to the membrane of the round w
the foot plate of the stapes. Less frequently the
improved by closing the perforation with a little p
cotton, or a small disc of rubber. A perforation

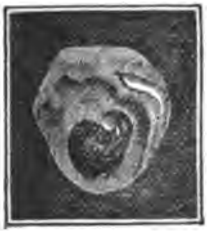

Fig. 35. Smaller perforation of the drum-head, with great ret
adhesion of the surrounding membrane. (After Politz

times be made to close by freshening the edges after discharge ceases. If it does not close after this procedure, a further aid will be found in fitting to the perforation a moist disc of sized paper. This excites an increased blood supply, a proliferation of cells and granulations, and so a final closure.

I have never seen a patient who was using any form of an *artificial drum-head* with any satisfaction, although very many of them have told me of their trials. When suppuration exists these artificial drums prevent its free escape and so further promote decomposition. When the canal is dry they act as any foreign body, causing irritation, cell proliferation, increased connective-tissue formation and thereby a loss of conducting power.

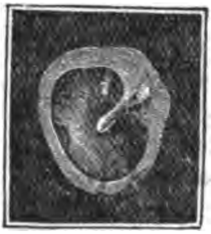

Fig. 36. Large perforation of the right drum-head. (After Politzer.)

The handle of the malleus is free and the long crus of the incus and the niche of the round window are visible.

Following after a cured suppuration, we frequently find the lower end of the canal very much altered from the normal arrangements. The edges or a part of the edge of a perforation may be adhered by connective bands to the posterior wall. *Bands of adhesion* may bind together other parts of the tympanum, or subdivide it into chambers. *Chalky deposits* may exist in portions of the membrane, or with connective tissue fill in the whole middle ear, enclosing the ossicles and destroying every normal appearance. Bands and adhesions can be divided or excised if it is believed that thereby hearing would be improved.

Deafness following a suppuration of the middle ear may not be very marked, if the perforation is small and the remaining portions of the membrane but little altered.

If the attack was acute, followed by a quick healing and closure of the perforation, perfect hearing may return. On the other hand, if a chronic suppuration leaves considerable perforation, altered character of the remaining membrane, adhesions of the ossicles to each other or to the walls, or of the membrane to the ossicles or posterior wall, then deafness will be expected. When there is loss of one or more ossicles with the whole or the lower portion of the membrane, deafness will be marked or nearly entire.

When the tympanum remains moist hearing is apt to be better than if it becomes very dry.

Tinnitus may occur, but it is not a very common symptom.

CHOLESTEATOMA.

As a late condition of chronic suppuration there may develop this obstinate disease—cholesteatoma.

The epidermis of the canal proliferates and desquamates. It extends into the tympanum, especially along the roof and into the attic and antrum. Cheesy masses may be removed from the lower end of the canal containing exfoliated epithelium, fat-globules, bacteria, and crystals of cholesterin. A foul smell usually accompanies this disease. Virchow reports his belief that they are true heteroplastic tumors.

In the mastoid or attic these masses may grow to a large size. The bony tissues become necrosed or are absorbed from pressure. When no masses may be seen through the speculum, it may be difficult to make a diagnosis except by finding some cheesy masses with gritty particles in the ear washings. The cholesteatomous ear is good ground for bacteria propagation and polyp formation. Free exit of pus is also interfered with.

FACIAL-NERVE PARALYSIS.

This may occur without other known cause than sitting in a draught of air while heated or perspiring. Among other causes there may be a participation of the nerve in middle ear suppurative inflammation ; an ulceration and necrosis of the bony canal; a sequestrum; an exudate or a tumor producing pressure; periostitis of the aqueductus Fallopii; paralysis from traumatism or central nervous disease. The results of mastoid operation should also be mentioned. From this latter cause the fibers supplying the orbicularis palpebrarum are less liable to be affected.

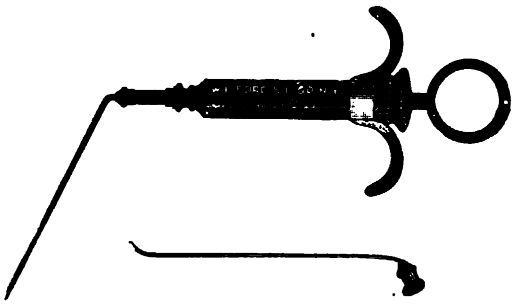

Fig. 37. Buck's attic syringe.

Treatment will be influenced by the cause. Any pressure or dead bone should be removed. It may be necessary to treat syphilis as a cause of pressure.

It is of prime importance in the early stages of facial paralysis that the affected muscles should have rest. A thick layer of absorbent cotton should be constantly kept applied to the paralyzed side, and this supplies both rest and heat.

No effort at massage, nor the use of electricity, should be made for at least one or two weeks. When used, the current of electricity should be no stronger than enough to cause muscular contractions. This agent is perhaps the most useful one in general cases and those resulting from traumatism, and the unfortunate effect of an operation. At first the sittings should be daily, and of not more than five minutes' duration.

Some advise the galvanic current, but I have had good results from the faradic, using the negative pole at the affected ear and the positive to the opposite mastoid and to the affected muscles. Such treatment given daily, or once in two days, is certainly a help, and tends to prevent muscular atrophy during paralysis. Recovery may be complete in from three to six weeks, but in many cases some slight disability of the muscles remains permanently.

The pole of the electric current for the affected side may be applied behind the ear to the mastoid region, or a pledget of wet cotton may be placed in the external auditory canal and the electrode applied to that, as a method of getting nearer to the nerve. Should this latter method be used, the canal should be carefully dried out afterwards.

Homœopathic Remedies:

Aconite.—In the early stages, and if there has been exposure to strong cold winds.

Belladonna.—Paralysis of the right side, with neuralgia of the fifth nerve.

Causticum.—Also for the right side, especially if associated with muscular twitchings.

Gelsemium.—If, as in rare cases, the paralysis follows some acute disease. Twitching of the muscles and neuralgia of the seventh nerve.

Graphites.—When there is a sensation as of cobweb on the face.

Hypericum.—When resulting from a traumatism of the nerve.

Kali hydriodicum will prove beneficial in cases of a syphilitic origin.

Rhus toxicodendron, when there is an established paralysis, and in persons of a rheumatic diathesis. From exposure to damp and windy weather.

Other remedies may be useful if specially indicated, by other conditions, or the known cause of the paralysis.

NECROSIS OF PORTIONS OF THE TEMPORAL BONE.

After scarlatina and from tuberculous or syphilitic taint, and occasionally after typhoid fever, there may be caries of some portion of the temporal bone following a middle ear suppuration. Pain is a pretty marked symptom, except in tuberculous and syphilitic cases.

The area involved may be very slight, or equal to a large part of the whole bone. The mastoid is the most apt to be affected, or the walls of the tympanum, the anvil or head of the mallet may be attacked.

Pain is in proportion to the amount of periostitis or interference with a free discharge of pus. The discharge is usually fœtid, ichorous and bloody. Granulations and polypi develop readily. Such serious and distressing symptoms as vertigo, tinnitus, nausea, vomiting, fever and insomnia may be an accompaniment. The meatus is usually swollen and excoriated, or even ulcerated.

The dangerous possibilities of this affection may be appreciated when it is remembered how thin a layer of bone separates the tympanum from the Fallopian canal, the cranial cavity above, the lateral sinus, carotid canal and even the cochlea and semi-circular canals. In rare instances these various cavities have been involved.

Treatment demands all that is directed for chronic suppuration, curettement of granulations and dead bone. These measures failing, or if a large sequestrum is present which cannot be removed through the canal, it becomes necessary to open the mastoid process and remove enough of the posterior wall of the canal to allow the removal of all dead bone and permit easy access to the tympanum. See "Mastoid operations."

DISEASES OF THE CRANIAL CAVITY CAUSED BY PURULENT DISEASES OF THE MIDDLE EAR.

Such intra-cranial complications may occur; by extension of the carious process through the temporal bone and the escape of pus into the cranial cavity; and by extension through the fenestræ and vessels that communicate with the two cavities.

MENINGITIS.

Symptoms.—Severe and constant, general or localized headache, increasing in severity and with photophobia, nausea, vomiting, insomnia, general hyperæsthesia, and loss of memory. Children are apt to have delirium and muscular twitchings of the face and extremities. Opisthotonos may be a symptom of an advanced stage. The pupils at first are contracted and later dilated (perhaps unequally), and irresponsive to light. Temperature is very variable, from 100° to 105° F., and apt to be higher in children. Pulse is rapid, but if there be cerebral compression it will be slowed temporarily. Respiration is jerky in inspiration, followed by a pause, and expiration is a long sigh. Paralysis of the extremities, hemiplegia or strabismus may occur. The final symptoms are usually incontinence of urine and stool, accelerated respiration, rapid and compressible pulse, general paralysis, coma and death.

Diagnosis.—This depends on the elimination of other causes. The constant presence of fever, headache and vomiting are very conclusive and if with this there be injection of the retina or a neuritis, the diagnosis is quite certain.

Prognosis.—Death is certain in the meningitis which goes on to pus formation, when it is an extension from middle ear suppuration, unless an operation be performed.

Treatment.—An ice cap should be worn continuously. See "Operations for Brain-Abscess."

SUBDURAL ABSCESS.

This is an accumulation of pus between the inner table of the skull and the meninges, localized by adhesions of the membrane to the bone. It is usually caused by an extension of disease products from the tympanum through the thin separating lamina of bone along the course of a minute blood-vessel.

Symptomatology.—Fever from 100° to 102° F., and pain varying in intensity over the temporal bone. Dr. A. H. Buck thinks that in acute middle ear suppuration in children a certain amount of localized meningitis is always present. In such cases relief follows a free discharge of pus from the ear. In cases where the pus forms, and there is extension to the cerebellar fossa, there will be vertigo and vomiting.

Diagnosis.—It is generally impossible to more than assume the presence of pus, unless other than the subdural space is involved.

Prognosis.—If the abscess extends to other internal regions, this is unfavorable. If it break externally, or be removed by operation, recovery may result.

Treatment.—The best measures are those that aim to prevent this condition by evacuating middle ear pus by a paracentesis when it is evident that it has formed. Otherwise, a Stacke operation, laying bare the tympanic cavity, or opening the skull to cleanse the pus cavity, if it can be found, will be necessary.

CEREBRAL AND CEREBELLAR ABSCESS.

This is sometimes a result of chronic suppuration of the middle ear, and is very difficult, as a rule, to diagnose except by exclusion, and then not till it is well advanced. We are guided by such symptoms as, otorrhœa, insomnia, constant moderate temperature and localized pain in the temporal or occipital region, with a steady decline of general health. *Treatment* is surgical.

PHLEBITIS AND THROMBOSIS OF THE LATERAL SINUS.

These serious conditions may result in cases of long continued and generally neglected chronic suppuration, where there has been a necrosis of the posterior wall of the tympanum through to the sinus, or by septic infection transmitted by the intercommunicating veins. *The cause* is similar then to that of cerebral abscess and meningitis. The condition develops suddenly, with pain in the neck or occiput, loss of appetite, chills and a remitting temperature of 104° F. Skin is dry, pulse rapid, tongue dry and furred, and there may be vertigo, vomiting, rigidity of the neck muscles, optic neuritis, delirium, convulsions and coma. In uninterrupted cases, death is usual in a few weeks from pulmonary pyæmia. An indication of the participation of the jugular vein in the process is the development of a dense cord along the edge of the sterno-mastoid muscle, with œdema and tenderness. The face, nose and lids are œdematous if the cavernous sinus is involved.

Etiology.—Only two causes are known for primary mastoid inflammation, and they are, in order of frequency, traumatism and exposure to cold. Generally mastoiditis is a complication, and it has been noted that it is in greater frequency during influenza epidemics. In most cases it is due to a gradual extension of purulent inflammation and an interference with free escape of discharges through the development of membranous adhesions, swelling of the membranous lining, and the formation of granulations.

It is well to remember that the relation of the antrum to the tympanic attic is such that fluid naturally gravitates into it when the recumbent posture is assumed. When such fluid is loaded with micro-organisms, then all the conditions are present for their development, and the results, which that means, to the integrity of the part.

Symptomatology.—In *acute mastoiditis* the pain is apt to be slight at first, gradually increasing in severity as the disease gains foot-hold. In the course of a few days, or even weeks, here will be fever up to 100° to 102° F., coated tongue and loss of appetite and energy.

When the periosteum is involved, there is a tenderness to pressure, redness, and swelling which will cause the auricle to stand out more sharply from the cranium.

Pain is not always referred altogether to the ear, but may be occipital, or even supra-orbital. The presence of pus in the soft structures is determined by fluctuation, sometimes very much masked by œdema. When pus is found in the tissues over the mastoid, it is generally the result of a periosteal abscess, or otherwise it has come through a bone fistula from the mastoid cells. The development of acute mastoiditis is very insidious. Before pus presents itself anywhere, great destruction may have been wrought in the process without any adequate symptoms. Pain varies very much in intensity.

Not all the symptoms can be expected to be present in every case. Within the canal the posterior wall is apt to be tender and frequently swollen and œdematous; the drum membrane bulging.

In a severe and advanced case, marked daily variations of temperature would lead to a suspicion of pyæmia or sinus-thrombosis. If pus escapes from the tympanum anteriorly, it may form a retropharyngeal or sub-maxillary abscess. The other complications of pus invasion have already been given.

In *chronic suppuration* of the *mastoid cells* consequent upon a chronic middle ear suppuration, the diagnostic symptoms are not so marked. Here one must be guided by the persisting discharge despite proper treatment, the foul odor, the bulging and tenderness of the post-superior wall, and the general impairment in the health of the patient.

Prognosis.—A large proportion of cases of acute mastoiditis recover without an operation. If there has been any destruction of bone tissue an operation is necssary, and if performed early the prognosis is favorable. When complications develop from absorption of pus—septicæmia—or the escape of pus into other cavities—subdural and brain abscess, phlebitis, meningitis and sinus-thrombosis—then prognosis is unfavorable.

Treatment.—A patient with incipient mastoiditis may b seen when the symptoms are only those of acute catarrhal or purulent inflamnation. In such a case, if there be signs of fluid in the tympanum, a long and free paracentesis should be made. If too minute an opening be made, it is very apt to close before there has been free drainage.

In acute inflammation it was formerly the custom to apply dry or moist heat, and it is true that, in what proves to be the milder attacks, they are the most agreeable applications to the patient, but now the ice bag is recognized to do the best work in subduing inflammation. To the patient the first application of ice is unpleasant.

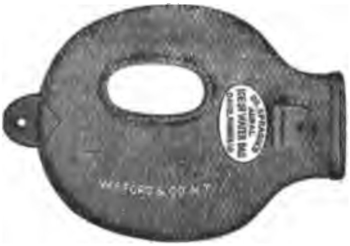

Fig. 38. Sprague's aural ice bag.

Ice may be presented in a bag which will fit just behind the ear, or in the shape of ice-cold water, running through a coil of rubber tubes over the mastoid. With the bag the ice has to be constantly replendished, while with the coil a large pail above to supply and another below the patient to receive the ice-water is necessary. This must be maintained for from one to three or four days, and again resorted to in case of recurrence of pain. This method gives very satisfactory results in many cases which have serious appearances, but if pus and necrosis are already present it may be expected to fail.

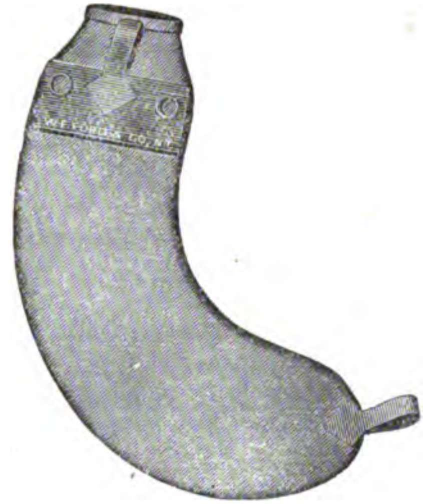

Fig. 39. **Bacon's aural ice bag.**

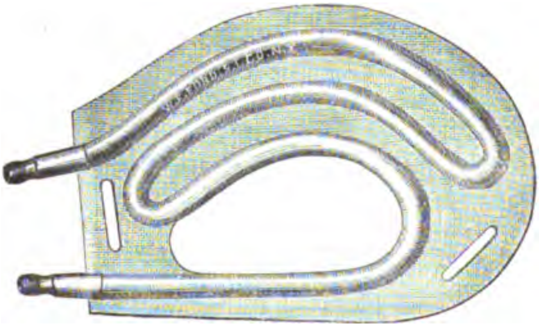

Fig. 40. Leiter's coil.

When the inflammation is acute the application of three or four leeches to the mastoid will afford relief to the patient. A good way to apply them is to take one at a time in a small vial of water, the open mouth of which is to be applied to desired spot. When the leech has taken a good hold the vial may be removed. Cupping of the mastoid may very much relieve severe pain.

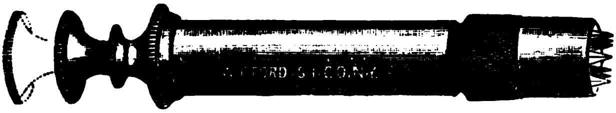

Fig. 41. Bacon's scarifier and cupper.

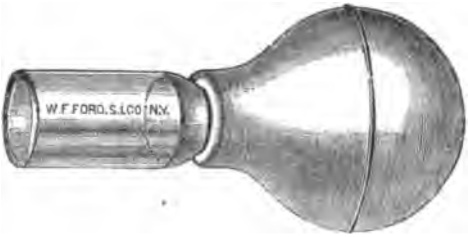

Fig. 42.

Good results sometimes follow counter irritation by mustard or turpentine to the mastoid.

It happens, occasionally, that ice is from the start intolerable to the patient. It should then be discontinued and other measures resorted to.

It is well to remember that considerable relief in the early stages of inflammation may be accomplished by the use of a saline laxative. If the patient's suffering is acute an anodyne is appropriate. When such measures as the above fail to effect a cure, operative measures should be resorted to, and these should not be too long delayed. There is danger, in delay, of greater extension of disease and to more vital regions. At the same time it is only proper to state that very alarming and serious symptoms which, in the opinion of good surgeons demanded operative treatment, have yielded to the above outlined method.

Not infrequently the patient or his family will refuse to allow an operation and then request it when suddenly very alarming symptoms develope—too late. This danger of a sudden fatal result should be pointed out to them. The disease is a dangerous one, and the operation is not, when done by a competent aural surgeon. No physician would feel capable of performing it without careful study of the anatomy involved and until he had practised it several times on the cadaver. The many important structures in the comparatively small space make the surgical anatomy an important study. It is only by personally and actually performing the operation on the cadaver that the danger spots can be learned, not to mention the proper handling of the instruments.

Wilde's incision consists in the opening of the integument behind the ear down to the bone, and is made parallel to the attachment of the auricle and about three-eighths of an inch from it. The indications for it are, the presence of pus, and fluctuation or a grave suspicion of it. If there be no fistula, and it is evident that the abscess is a subperiosteal one, it is treated by the antiseptic open-wound method till it heals.

INDICATIONS FOR MASTOID OPERATIONS.

Considerable difference of opinion has existed between aural surgeons as to hard and fast rules for operating. The very conservative are apt to think him radical who operates for other conditions than acute mastoid inflammation which has resisted other treatment.

The danger of this is that "other treatment" may lengthen itself out, till such serious necrosis exists that the operation may be of no avail. Other structures may be invaded and septicæmia supervene, if an operation is too long delayed.

Six good guiding rules may be given as being in accord with the opinion of the best authorities.

1. If there be acute inflammation of the mastoid which has resisted palliative treatment.
2. If there have been repeated swellings of the mastoid and abscesses of the middle ear.
3. If there be bulging of the superior and posterior walls of the canal, with a foul otorrhœa.
4. If there be a fistula.
5. If there be severe pains in the same side of the head as the suppurating ear, not cured by other treatment.

6. If a foul smelling otorrhœa resists all other treatment. The best light for operating is obtained by an electric headlight having an adjustable focus, and firmly fixed upon the operator's forehead, as shown in Fig. 42. This is a great improvement upon direct or reflected light. It is more intense, it enables the operator to move about, and there are no shadows.

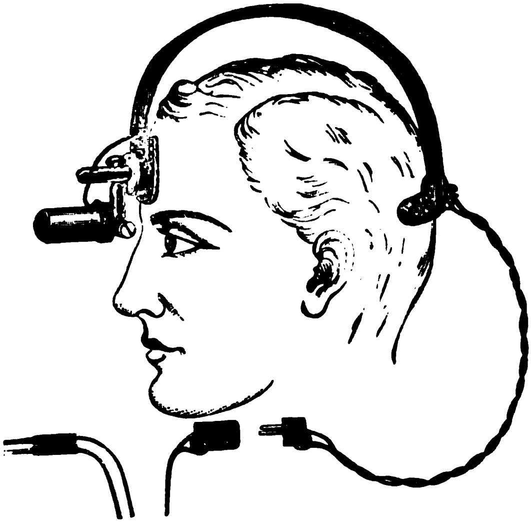

Fig. 42. Phillip's Electric Illuminator, to be worn upon the head of the operator.

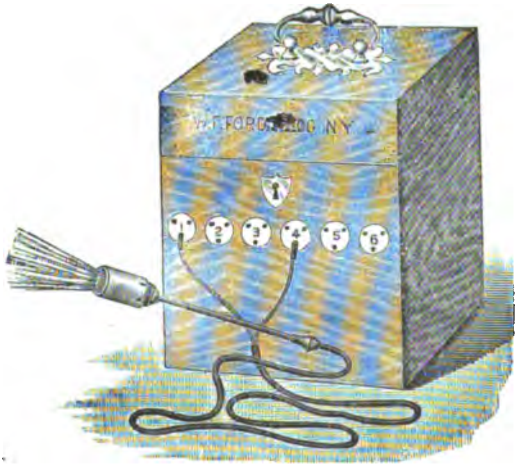

Fig. 43. Storage Battery.

The preparation of the patient.—Several hours before the operation the patient's mastoid and the space for three inches around it should be shaved. The surfaces in the region of the mastoid should be washed with soap and water, then with ether, and finally with a solution of bichloride, 1 to 1000, and syringe the canal with this latter solution. Dress and bandage the part with antiseptic gauze and protect the hair with a rubber cap or towel. The bowels should be relaxed the evening before and only liquid food allowed on the day of operating, and none of that for several hours before the operation.

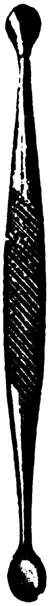

Fig. 44. Sharp Spoon.

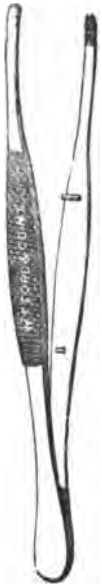

Fig. 45. Thumb Forceps.

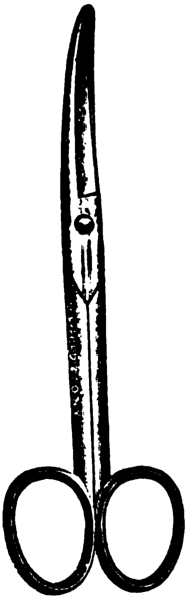

Fig. 46. Scissors curved on the flat.

Ether is a safer anæsthetic than chloroform. The patient's shoulders should be free of clothing and he should be covered with aseptic sheets and towels.

All *those assisting* in the operation should wear aseptic gowns; should scrub their forearms, hands and nails with soap and water and then wash with powdered chloride of lime and carbonate of soda under running water, and finally rinse them in sterile water.

The operating table should be high enough to avoid the fatigue of too much stooping.

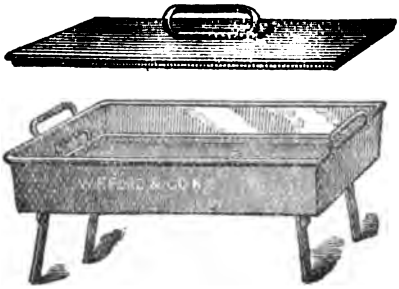

Fig. 47. Small sterilizer.

The instruments should be sterilized. Those required are two or more strong scalpels, four or more artery forceps, a periosteum elevator, two retractors—self-retaining or otherwise,—several sizes of chisels and gouges, a wooden mallet, three sizes of strong curettes, a mastoid guide, strong forceps and probes—straight and bent—and tongue forceps. Hot

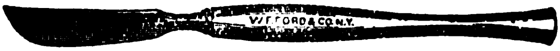

Fig. 48. Strong Mastoid Scalpel.

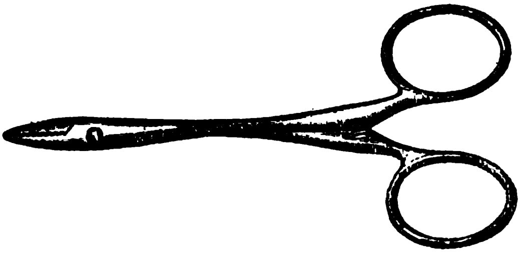

Fig. 49. Artery Forceps.

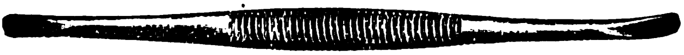

Fig. 50. Periosteum Elevator.

water should be available under gravity or with a syringe. Such other tools, as needles, scissors, iodoform, and plain gauze, cotton, needle-holder, and directors, should also be at hand.

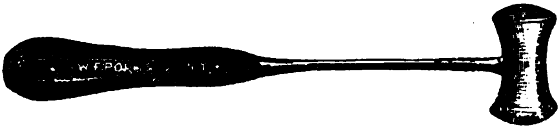

Fig. 51. Wooden Mastoid Mallet.

Fig. 52. Steel Mastoid Sound, Guide, and Probe.

MASTOID OPERATIONS.

For purposes of convenience in reference, it will be well to describe mastoid operations under three divisions: (1) the SCHWARTZE, or simple; (2) the STACKE, and (3) the MODIFIED operation.

The *Schwartze operation* is the one most frequently made, is adapted to simple mastoid cases and opens the mastoid down to the antrum.

The *Stacke operation* makes no opening in the mastoid process externally, but displaces the auricle forward, turns out the membranous lining of the canal, and through the canal converts the latter with the attic and antrum into one cavity.

The *Modified operation* includes all of the simple one, and also opens the tympanum, removes a part of the superior and posterior wall of the canal and makes these spaces into one large cavity. One or more of the ossicles may also be removed.

The *first*, or *Schwartze operation* is the oldest and is now made in acute cases to save life which is in danger by reason of an acute destructive process.

The *second* and *third* are adapted to the permanent cure of long-standing chronic cases of suppuration which have resisted all other modes of treatment.

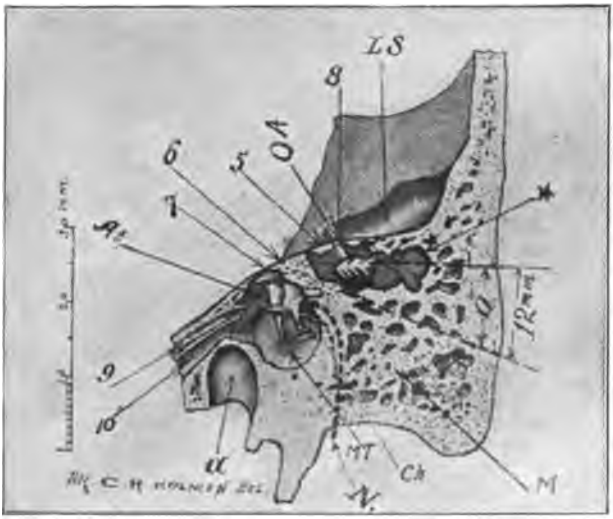

Fig. 53.

Fig. 53. Perpendicular section through the right temporal bone, beginning at line *BB*, behind the opening *O*, in mastoid cut (Fig. 56) and extending inward and forward, cutting the Eustachian tube in its long axis. (After C. R. Holmes.)

N, dotted lines to show course of facial and chorda tympani nerves; *M*, mastoid; *Ch*, chorda tympani nerve; *MT*, membrana tympani; *a*, canal for internal carotid; *10*, Eustachian tube; *9*, processus cochliariformis; *At*, attic; *7* and *8*, show defects in the bone covering the attic and antrum; *OA*, opening into antrum; *LS*, lateral sinus; *, antrum; *O*, dotted lines indicating funnel shaped opening.

The *primary incision* is made with a strong scalpel, beginning immediately above the attachment of the auricle and following its outline at the same distance, posteriorly, to the tip of the mastoid process. Dench advises that the incision be made ⅛ of an inch behind the auricular attachment, and says that there is less displacement of the auricle in the healing process, because there is less swelling of the anterior lip of the wound. Others advise various distances from ¼ to ½ an inch.

It is well to make this first sweep of the knife as firm and deep as possible, so that a second, at least, may cut evenly through the periosteum. Four or five vessels will now need to be clamped with forceps. The periosteum elevator is next used to raise and force forward the anterior flap, including the auricle, so as to expose the upper and posterior margin of the osseous meatus. The posterior flap is displaced in the same way in the opposite direction.

Fig. 54. Retractor.

A broad retracting hook with four sharp teeth may be used by an assistant to hold the soft tissue back on either side, or Alport's self-retaining double retraction hooks may be used.

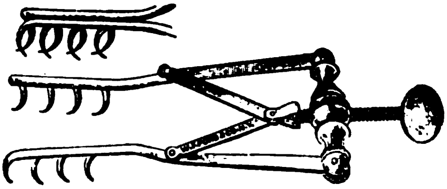

Fig. 55. Alport's Self-retaining Retractors.

In this way there is obtained a good, clear and ample field of operation. The posterior wall of the bony meatus, the superior spine of the meatus and the linea temporalis will now be in view· Should there be a fistulous opening in the bone its sinus should be followed inward, widening and enlarging it as much as possible with the curette, such a diseased tract being a convenient guide to the deeper portions of the mastoid.

In case the bone externally be in its normal state the area from which to take the first chip must be decided upon. The antrum is the objective point. There is frequently a diseased condition there of which no objective signs are manifest until it is reached. The lateral sinus and middle fossa are the places to be avoided, and their relative position is variable.

As the mastoid process varies considerably in size, shape and thickness, as well as in the number and size of the pneumatic spaces contained therein, it is well to bear in mind certain *landmarks* as a general guide. There are, in most cases, two bony landmarks present. One is the *linea temporalis*, a horizontal ridge formed by the extension backwards of the zygomatic process. It has been shown that in the average case this is lower than the middle cerebral fossa. Therefore, an opening which does not extend above this line will not endanger the brain. The other landmark is the *superior spine of the meatus*. This spine usually marks a point higher than the floor of the antrum. The *lateral sinus* is stated by Dench to be generally *half an inch* behind the posterior margin of the bony canal, and by others to be *a trifle nearer.*

Should the natural landmarks be absent or indistinct, certain guiding lines can be drawn as follows: First, a horizontal line, in the erect position, tangent to the superior margin of the bony meatus. Second, a vertical line tangent to the edge of the posterior margin of the meatus, touching the spine, and crossing the first line at right angles.

With the hammer and chisel we can now outline an oval touching these lines which shall be 8 *mm.* horizontally and 12 *mm.* vertically. This makes a safe starting area, and may be considered the base of a cone, the apex being at the antrum.

The large chisel is used for the first part of the operation. Large chips of bone may be removed at this stage.

As an entrance is effected, smaller chisels and smaller chips are in order. In this way the cone is converted into a funnel-

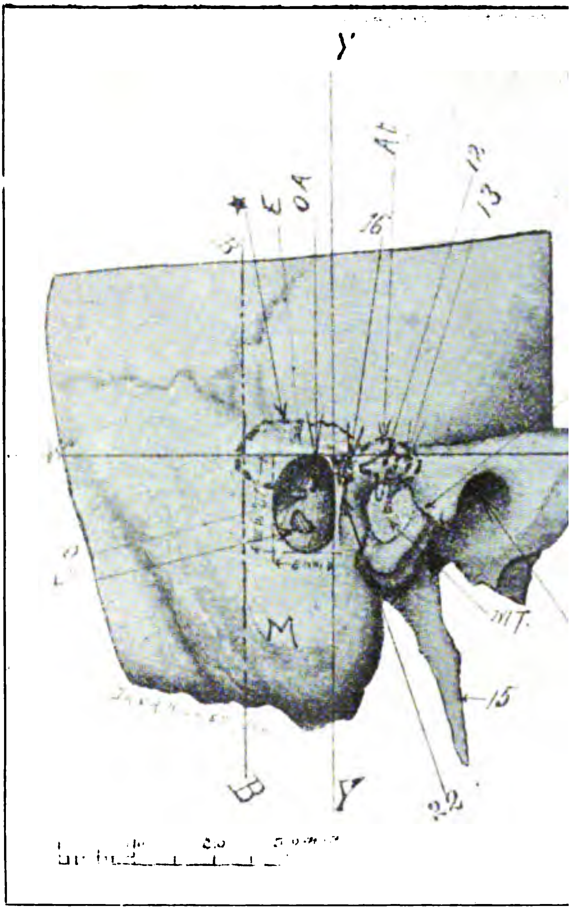

Fig. 56.

Fig. 56. Opening of the Antrum. (After C. R. Holr

WW' and *YY*, horizontal and perpendicular planes of the sk
mastoid leading to antrum; *OA*, antrum; *LS*. lateral sinus;
posterior wall of the external meatus; *15*, styloid process; *MT*,
glenoid cavity; *28*, Glaserian fissure; *17*, zygomatic process;
hammer and anvil and location of attic; *16*, spina supra meatus;
position of antrum; *E*, linea temporalis.

shaped opening, with a general direction inwards and slightly forwards. The thickness of bone between the funnel and canal will be about 1 *mm.* at the meatus and from 3 *mm.* to 4 *mm.* at the tympanum. The upper surface of the funnel should have a slight downward inclination, to guard against injury to the dura in the middle fossa. The posterior and lower walls should have a decided inward and upward slant, to give the lateral sinus as wide a berth as possible.

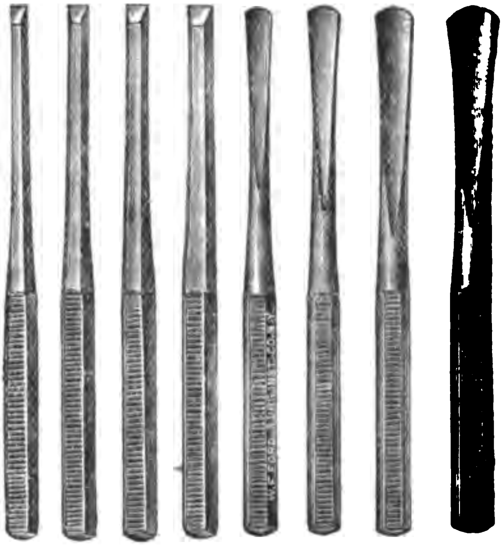

Fig. 57. Set of Schwartze's Chisels and Gouges.

Eight *mm.* laterally is considerably under the ½ *in.* which Dench mentions, but still the lateral sinus may, exceptionally, be encountered from 4 *mm.* to 20 *mm.* from the bony canal, and also at a variable depth from the surface of the temporal bone, and these facts it is well to remember.

When working in a region of suspicion, very thin chips should be removed. In most cases, where the sinus is inadvertently opened it is not injured. The chiseling should be directed downward and forward for the upper wall of the funnel, and upward and forward for the lower wall. No chips of bone should be permitted to remain in the funnel, but should be constantly removed with the angular forceps. If blood oozes into the field of work, it should be constantly sponged away with small pieces of aseptic gauze.

Small pneumatic cells will be exposed by the first few chips, and larger ones with increased depth. The mastoid probe, (Fig. 52,) stiff and bent at the end, is constantly employed to explore the larger cells.

The antrum is situated some 6 to 12 *mm.* from the *spina supra meatum.* When it is finally opened into, the exploring probe passes easily into the *aditus ad antrum,* its tip being in the attic. If pus or diseased bone has not been encountered before, it is expected here and should be wiped and cleaned away. For softened and diseased bone the curette should be used, following wherever it leads and scraping down to healthy tissue.

Having now entered and freely opened the antrum, the bent probe should be used to explore all pneumatic cells, and all overhanging bone should be cut away even if it is necessary to return to the surface of the bone to accomplish it, the object being to leave the bony surface as smooth as possible.

In old and neglected cases, as has been heretofore mentioned, it may happen that pus has escaped from the mastoid into the other structures.

Should it be found that pus has burrowed through into the digastric fossa it will be necessary to make an incision into the neck externally, reaching the pus and permitting drainage. It is best to insert a drainage tube.

Should the squamous portion of the temporal bone be diseased an incision extending backward, from opposite the middle of the auricle, should be made to get working room. The periosteum should be raised and all diseased conditions curetted away.

When all diseased tissue is removed the periosteum is to be reapplied, and the external incisions brought into apposition, with deep sutures, except over the opening into the mastoid. This opening should be left large for drainage, inspection and dressing. In adults the space in the bone—after being thoroughly cleaned, leaving no small pieces of bone—should be

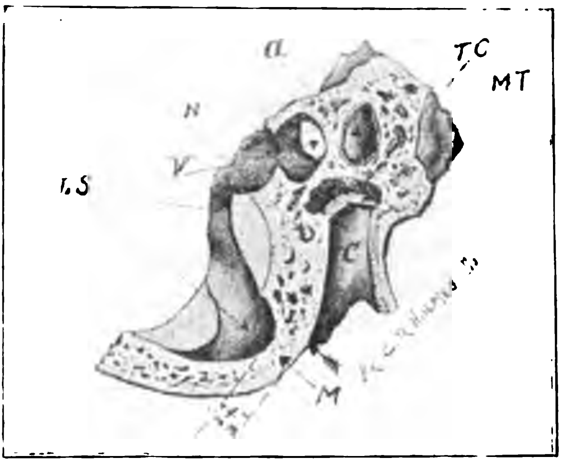

Fig. 58

Fig. 58. Horizontal section through the right temporal bone, showing how close the lateral sinus may come to the external canal in some cases, and how little the bone may be concellated.

a, internal carotid artery; *V*, internal jugular vein. The other letters indicate same as in figure 59.

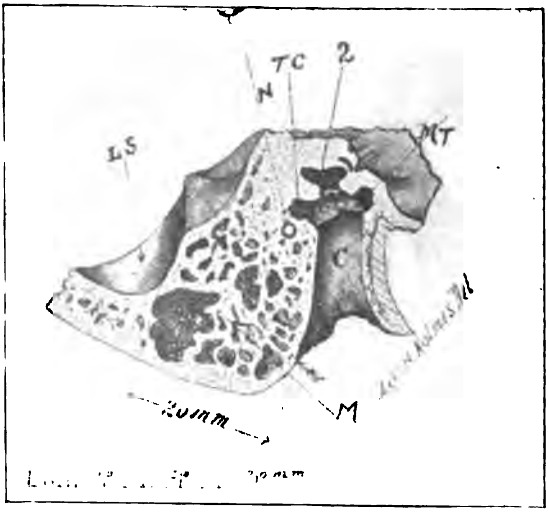

Fig. 59.

Fig. 59. Horizontal section through the right temporal bone, showing distance between lateral sinus and external canal. Cut begins below the center of external canal, passing obliquely upward and inward. (After C. R. Holmes.)

L.S. lateral sinus; *M.* mastoid; *TC.* tympanic cavity; *2*, vestibule; *MT.* membrana tympani; *C.* external canal; *small arrow*, points where a perpendicular line from the spina supra meatus would touch.

tightly packed with iodoform gauze and the space between the soft tissues more loosely packed. In children it should be packed with an uniform firmness throughout.

The outside wound is then covered with several layers of, first, iodoform gauze, and then bichloride gauze. Cover this with sterilized cotton and bandage the whole head. The iodoform gauze packed into the mastoid should be in the shape of long narrow strips in order to facilitate removal. It is usual to find that the temperature will drop to normal, or nearly normal, in the first twenty-four hours, provided the operation has been thorough and well indicated.

The *first dressing* should be left in place from four to six days, unless a rise of temperature suggests its earlier removal. Following this first removal it is generally best to dress the wound daily, till the appearance and character of the discharge permits a lengthening of the interval. At each dressing both the ear and wound are to be irrigated freely with a solution of bichloride of mercury, 1–5000, the wound being washed first. Any exuberant granulation tissue may be touched with the stick of nitrate of silver, or, if very large, removed with scissors or curette.

THE STACKE OPERATION.

The first incision is made the same as in the simple operation, except that it is carried forward above the insertion of the auricle to a point directly above the anterior wall of the meatus. Some operators advise the beginning of this incision at the tip of the mastoid and then cut upward, saying that in cutting the other way there is danger of the knife slipping off the tip and burying itself in the neck, thereby endangering the large vessels.

After the periosteum is raised to the mouth of the canal, the elevator is turned inward to separate it from the bony wall. At the thin portion near the drum-membrane resistance ceases as the periosteum tears loose. This separation is made to include the whole canal, although some operators do not detach it from the anterior wall, but crowd to that part the periosteum from the other walls. The integrity of the glove-finger-like periosteum is preserved and turned out and forward on the cheek by a piece of tape, threaded through the canal, and held in place by an assistant. The drum-head—if present—is dissected along its upper circumference, before and behind the malleus. A smaller steel probe, bent at the end, is now brought into use to explore the attic where it hooks up over the superior wall of the canal. The attic should first be fully opened by the use of the chisel. It is better to first remove the superior wall at the bottom of the canal anterior to the malleus, and then posterior to that bone.

The tensor-tympani is to be cut, and the anvil removed with the pincette forceps. The malleus is now removed with whatever there may be left of the drum-membrane. The stapes should be left in position for fear of damage to the vestibule.

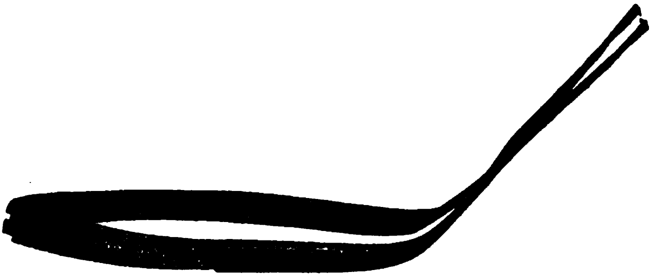
Fig. 61. McKay's angular Incus Forceps.

The rounded portion of bone which lies posteriorly and below the aditus ad antrum covers the facial nerve as it takes its course downward, forward and outward. Little or no effort should be made to thin down this prominence, because it is impossible to know how thin may be the covering of the nerve. When working in this region, the face should be watched for the first sign of a muscular spasm, which is an indication to desist. It is now necessary to make as free an opening into the antrum as possible, and the upper part of the posterior wall has to be attacked.

As a rule, we may assume that the facial nerve takes its course *forward* and *downward* under the posterior margin of the tympanic ring at the junction of the upper and middle thirds. Above this point it is safe to chisel away the bone, while below it is dangerous.

In cutting away this upper section of bone a mastoid guide may be used. An excellent one has been devised by Bishop

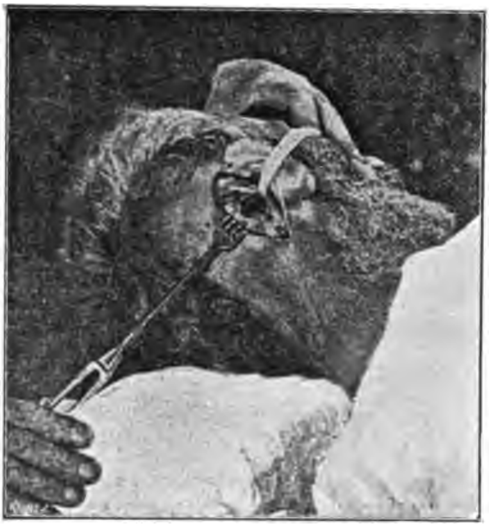

Fig. 60.

Fig. 60. The Stacke operation completed. (After C. R. Holmes.)

which, with a small bent end through the aditus ad antrum, is so arranged that the other larger bent end lies downward over the cheek at the angle of the mouth. The shank of the smaller or antrum end then falls over the Fallopian canal containing the nerve, and the chisel will strike the guide, in case of a slip, before it could reach the nerve. With these precautions, a large space is cleared of cell walls in the antrum and all diseased tissue cleaned out.

The canal, attic and antrum will now form one large space, with no external bony opening other than the external meatus. The next step is the re-application of the soft tissues of the canal. The healing process is very much shortened in duration if skin tissue can be made to extend and line the whole exposed bony cavity, and to this end the epidermis of the canal lining is longitudinally split, posteriorly, from the meatus inwards and the two flaps applied as far as they will reach to the raw surface of the newly-made cavity. Sometimes a second incision at right angles to the first will allow the better placing of a flap. To the same end, also, *skin-grafting* is frequently successfully resorted to. The external mastoid incision should be completely closed with interrupted sutures. The cavity in the bone should be firmly packed, through and including the canal, with strips of iodoform gauze.

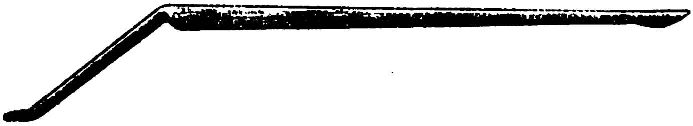

Fig. 62. Bishop's Mastoid Guide.

A failure to firmly pack this space would allow a development of exuberant granulations, which would delay the ultimate healing. Further dressing is the same as that for the simple operation. The after-treatment of mastoid cases is often much shortened by the happy results of skin-grafting, and, therefore, the various steps in two well-known methods will be presented.

SKIN-GRAFTING BY REVERDIN'S METHOD consists in transplanting small grafts, of only the superficial epithelium, to the granulating surface. These may be cut from an eighth to a twelfth of an inch in diameter, from the skin of the patient or other person. The granulating surface needs to be quite free of bleeding and pus formation, as either condition would have the effect of floating off the grafts. In preparing the granulating surface *no antiseptics* should be used, as they prevent the successful taking of the graft; but asepsis, in the shape of an irrigation with the normal salt solution, should be plentifully supplied. The skin from which to take the grafts should be cleaned, and scoured, and aseptically dressed for a day or two before the operation. When the grafts are in place they should be covered with a piece of sterilized rubber-tissue, upon which is placed sterilized gauze and cotton, the dressing to remain in place for one week. Then the dressing should be renewed in the same manner for another week. Some grafts may not take, but even those which do not will usually leave enough epithelial elements behind them to form little islands. When once well-established the grafts proliferate rapidly, till the whole surface becomes covered with epithelium.

THIERSCH'S METHOD consists in covering the prepared granulating or raw surface with strips of skin consisting of the epidermal and papillary layers, from two to four centimeters wide and of variable length. The further steps in the operation are the same as by Reverdin's method.

In cutting the grafts, a very sharp knife or razor is necessary, and the skin from which it is taken must be stretched very tight.

THE MODIFIED MASTOID OPERATION.

THE MODIFIED OPERATION is the same as the Schwartze or simple operation, as far as the point where it becomes possible to pass the probe through the aditus ad antrum, and, in addition, it includes, as has been already stated, the removal of portions of the posterior and superior walls, and, occasionally, one or more ossicles. These further steps begin with the displacement of the auricle forward, and the detachment of the periosteum from the posterior and superior walls of the bony canal. This detached portion is pushed over to the other sides, and the attic opened by chiseling away the deeper part of the superior bony wall, by removing the upper third of the posterior permit curetting of these spaces and also the r ossicles as may be diseased. The parts should b chips of bone and irrigated with a bichloride of n in the strength of from 1–3000 to 1–5000.

The canal lining is split and applied as heret the cavities packed with iodoform gauze, the e covered with layers of antiseptic gauze and cotto head bandaged. As in the simple operation, it i the upper and lower parts of the external incision

The tip of the mastoid process is freq by only one large pneumatic cell, and when that this is not free from disease, it is best to curved scissors, all the soft tissue attachments—n ments—and cut off the whole prominence with geur forceps. Some authorities advise that the t should always be removed.

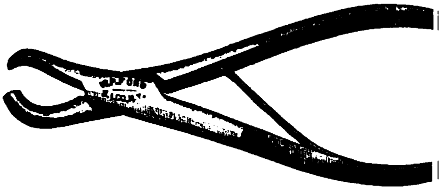

Fig. 63. Rongeur Forceps.

For a *cholesteatoma* which involved only th operation would need to be made.

As stated heretofore, however, the diagn quently very difficult and the disease is as m more apt, to involve the antrum, in which case th would be required would be what I have d "modified" one.

The various steps in these operations would from special indications, from the manner in already set down.

OPERATIONS FOR BRAIN ABSCESS.

For a suspected *cerebral abscess* incident to aural disease a trephine is generally used, the center of which shall enter at a point seven-eighths of an inch above the centre of the meatus. The scalp and periosteum may be laid back by a circular flap or a crossed incision. The dura is usually opened with a semicircular flap. Should no pus appear, a director, an aspirator or a sharp bistoury, may be inserted in various directions. When pus is found, the opening should be enlarged and the cavity cleaned as much as possible. The cavity should be packed with iodoform gauze, and a rubber drainage-tube inserted. When no pus is found, the dura should be sutured with catgut and the bone button replaced. If an abscess is suspected over the roof of the antrum, when operating upon an abscess or cholesteatoma in that cavity, then the operation should be continued till enough of the roof is removed to allow of an examination of the dura. The presence of granulations upon it or the absence of pulsations would indicate the propriety of incising this membrane. An opening to the dura may be made by an *extension of Stacke's operation*, taking off the roof of the tympanum and part of the roof of the canal, if pus is suspected in this region.

The *cerebellum* may be explored if care is taken to avoid the lateral and occipital sinuses. Localizing symptoms of brain abscess may be occasionally present, but in most cases they are not. The completed dressing, after opening the brain cavity, is like that of mastoid operations.

OPERATION FOR EXCISION OF THE OSSICLES.

This is sometimes done in *sclerosis* for *tinnitus and deafness*, as heretofore mentioned, or *for caries and necrosis* of these bones, or of the walls of the tympanum.

In the former case, the first step is to remove the membrane throughout its circumference. The ear should be syringed with an antiseptic solution, and the instruments sterilized. The local use of cocaine will hardly suffice, and ether should be given to produce moderate anæsthesia. Schleich's solution for brief anæsthesia is also appropriate. A brilliant, reflected illumination in a dark room is necessary. The electric head-light is, as a rule, preferred. An incision is made with a sharp bistoury behind the short process near the periphery, and then, after substituting a probe-pointed knife, this is continued downward, across the floor and up the other wall. The upper and more vascular portion of the membrane is left till the last. The articulation of the incus and stapes is now to be divided with an angular knife, when the incus may be extracted with a hooked probe. After dividing the ligament of the tensor tympani, the malleus may be removed with delicate forceps.

During the operation the rapid use of cotton-carriers, which must be prepared in considerable number, will keep the field quite free of blood, but in case bleeding is considerable the canal should be syringed with quite hot water.

The dressing will consist of drying the canal and dusting with Aristol. Healing is generally prompt after a short period of discharging serum. Occasionally there is considerable reaction and formation of pus. The patient should be kept quiet.

Following the removal of the membrane, its complete re-formation has been reported.

THE INTERNAL EAR.

ANATOMY OF THE INTERNAL EAR.

The *inner ear* is the essential part of the organ of hearing, and is contained in the petrous portion of the temporal bone, being wholly secluded from observation.

It consists of a complex cavity—the *osseous labyrinth*—hollowed out of the bone, in which is the *membranous labyrinth.*

THE OSSEOUS LABYRINTH.

The *osseous labyrinth* is divided into three parts; the vestibule, the semi-circular canals and the cochlea. These spaces are lined by a thin periosteal membrane and filled with a clear fluid named perilymph. It is in this perilymph that the *membranous labyrinth* floats or is supported.

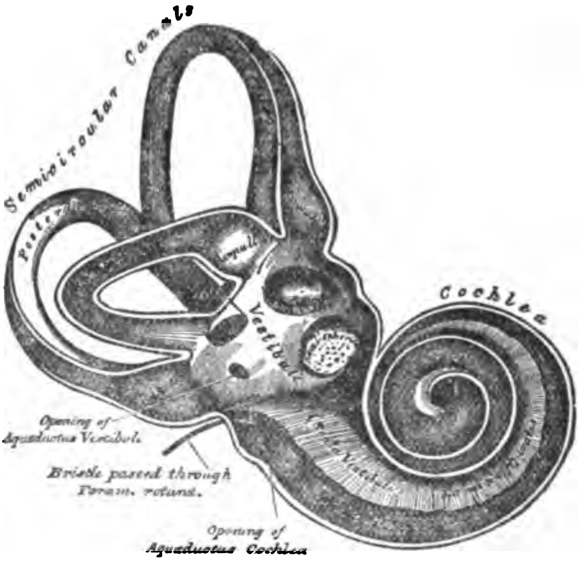
Semicircular Canals
Posterior
Ampulla
Vestibule
Cochlea
Opening of Aquaductus Vestibuli
Bristle passed through Foram. rotund.
Opening of Aquaductus Cochlea

Fig. 64. The Osseous Labyrinth laid open. (Enlarged—after Gray.)

The membranous structure is lined with epitheliu
tains a fluid named *endolymph.* It is subdivided
saccule, *utricle*, *semi-circular canals* and *membranous c*
various points it receives branches of the auditory

The *vestibule* is the entrance chamber to the laby
communicates posteriorly with the semi-circular ca
front with the cochlea. It is of irregular shape
elevation of some 5 *mm*, while its other measure

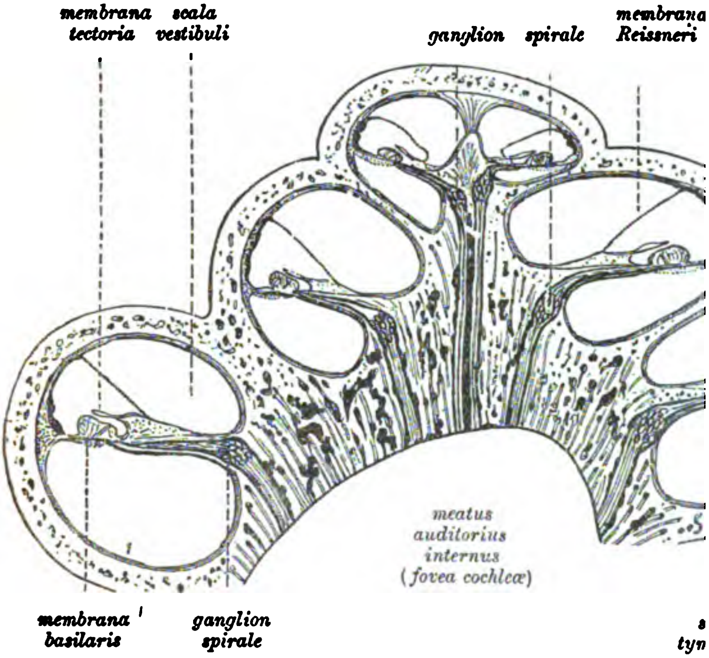

Fig. 65. Diagrammatic section through the middle of the cochl

smaller. In the outer wall is the oval window, fill
a membrane and the foot-plate of the stapes. On the
is the *fovea hemispherica*, a small depression, throug
tions in which pass numerous branches of the audi
to the saccule. Behind this fossa is the *crista*
verticle ridge. On the roof the crista terminates in
and below it bifurcates to enclose the *recessus cochlea*
fossa which transmits, through perforations, a numb
fibers and receives the entrance of the *ductus cochle*

Behind the lower end of the ridge, in a groove, is the *aqueduct of the vestibule*. This becomes a canal, passing backward into the petrous bone, and transmits the *endolymphatic duct* and a vein.

In the roof are perforations for the passage of auditory nerve branches to the utricle, and to the superior and external semi-circular canals.

The *semi-circular canals* are three in number and are above and behind the vestibule. They are of imperfect roundness, unequal length, and describe the greater part of a circle. Their diameter is about one-twentieth of an inch, and at one end each presents an *ampulla* or dilated portion of more than twice the size of the tube. At the back of the vestibule are five openings, the mouths of the tubes, one being common to two canals.

The *superior semi-circular canal*, 19 *mm*. long, *is vertical* and lies *transversely* in the petrous bone.

The *posterior semi-circular canal* is also *vertical and directed backwards*. This is the longest, being 22 *mm*. in length. The non-ampulated ends of these two tubes make a common opening into the vestibule.

The *external semi-circular canal*, 15 *mm*., is *horizontal* and *arches outwards*, having two independent openings in the vestibule. Thus it is that all the tubes are at right angles to each other.

The *cochlea* is a space in the bone, shaped like a spiral, blunt cone and frequently likened to a snail in shape. The base looks toward the internal auditory meatus and the apex is directed outwards, downwards and forwards, and is close to the canal of the tensor tympani muscle. The base measures about 9 *mm*. and the pyramid 5 *mm*. This gradually tapering spiral tube has a central column—*the modiolus*—formed of its inner walls.

The tube of the cochlea is partially bisected along its whole extent by a shelf of bone, the *spiral bony lamina*, projecting out from the modiolus.

In the recent condition there is a membranous extension from this spiral bony shelf to the outer wall, thus making of

THE MEMBRANOUS LABYRINTH.

There is within the bony labyrinth, and separated in most parts from its lining membrane, membranous structures which closely follow the shape of the cavities in which they lie. Upon them is spread out the ultimate ramifications of the auditory nerve. Along the convex border of the canals, and at the entrance of the nerves, and in the ampullæ, they are fixed to the walls. In the cochlea this membranous structure completes the septum between the scalæ and encloses an intermediate passage called the *membranous canal of the cochleæ*. The liquid without the membranous structure is the perilymph, within, the endolymph.

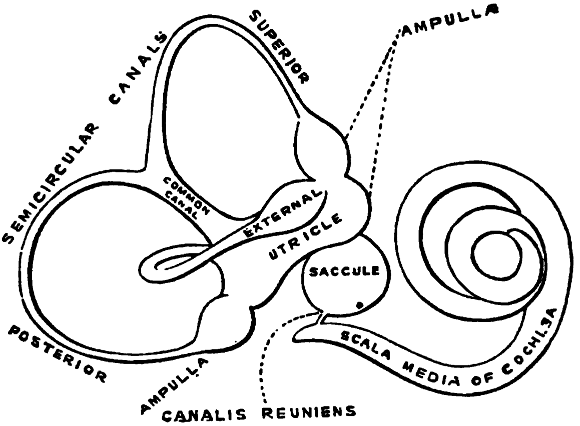

Fig. 66. The Membranous Labyrinth, diagrammatic. (Enlarged after Gray.)

Within the vestibule are two membranous structures or sacs, the *utricle*, connected with the semi-circular canals, and the *saccule* with the cochlea. These two sacs, although close together have only an indirect communication with each other.

The *utricle* is the larger, of irregular oblong form and occupies the upper and back part of the vestibule. This upper part of the vestibule is called the *fovea hemi-elliptica*. Into this fovea-end of the utricle, opposite the crista vestibuli, enter several small branches of the auditory nerve. At this point the wall of the utricle is thickened, and covered with auditory epithelium (*macula acoustica utriculi*), and small masses of calcareous particles (*otoliths*). This macula presents a concave surface inwards. The ends of all the membranous semi-circular canals take their origin from the utricle, and a very small canal (*canalis utriculo-saccularis*) takes its origin from the antro-mesial wall of the utricle to join with another one from the saccule forming the *ductus endolymphaticus*.

In the lower and front part of the vestibule is the smaller *saccule*, of irregular oval form. In the hollow of the fovea hemispherica it receives many branches of the auditory nerve at a *macula* similar to that in the utricle.

The *canalis reuniens* is a small duct at the lower end of the saccule which opens into the lower end of the cochlea. There is also an epithelium-lined canal (*saccus endo-lymphaticus*) from the posterior wall of the saccus, passing through the aqueductus vestibuli, to end blindly in the tissue of the dura mater. Near its origin this canal is joined by the very small tube from the utricle to form their intercommunication.

The MEMBRANOUS SEMI-CIRCULAR CANALS are about one-fourth the size of the osseous tubes in which they are lodged, and are ampullated to conform to their shape. The membranous ampullæ are comparatively larger, however, for they nearly fill the bony ones in which they lie. That part of the membranous tube which is toward the convexity of the semi-circle of the canal is fixed, whilst the opposite portion is free. The fixed portion is flattened in the ampulla and receives branches of nerves and blood-vessels, and on its inner surface is a transverse projection which partly divides the cavity into two, and broadens out somewhat at either end. This septum is tipped with auditory epithelium and termed the *crista acoustica*.

Within the internal auditory meatus the *eighth nerve* divides into two branches, which pass, in small filaments, through the bone and are distributed to the cochlea and vestibule.

The *internal auditory artery* is a branch of the basilar, and accompanies the nerve in small vessels.

The *structure of the utricle, saccule, and semi-circular canals* does not in general differ much, one from the other. They are composed of three layers, an *outer fibrous stratum* not unlike periosteum tissue, and freely supplied with small blood-vessels, a *tunica propria*, which is a clear membranous structure with small papilliform eminences on its inner surface, and an *epithelial lining* of flattened cells. In the *ampullæ*, *saccule* and *utricle* where they are connected with the bony wall, the tunica propria is much thickened, and in the ampullæ it forms the *transverse septum* and *crista acoustica*. Through the substance of this thickening the nerve-fibers pass to the edge of the ridge, and over it the epithelium is of an elongated columnar form, and is surmounted by long, conical, gradually tapering filaments (*auditory hairs*), which project stiffly into the cavity for a distance of about 0.03 *mm*. A single hair projects from each columnar cell, the lower end of which is rounded and enlarged. The branching axis-cylinders of the nerves ramify amongst the epithelial cells without direct connection. Between and beneath the columnar cells are very long nucleated *fibre-cells*, which are probably sustentacular in function.

The MEMBRANOUS COCHLEA follows the shape of the bony cavity in which it is contained, and in structure is very like the membranous semi-circular canals except in the modifications presented in its epithelial lining.

As stated before, the division of the tube of the cochlea is completed by the extension outward from the spiral lamina of a membrane (*basilar membrane*) to the opposite wall, where it unites with the periosteum. The upper division of the tube is farther divided by another and more delicate membrane (*membrane of Reissner*), which passes from the upper part of the osseous lamina a little distance from its end, and stretches obliquely upwards and outwards also to connect with the periosteum. This forms a triangular space bounded above by the membrane of Reissner, below by the basilar membrane, and with a base made up of the outer osseous wall of the cochlea. At the base and apex of the cochlea this triangular canal (*ductus cochlearis*) ends in a blind extremity; that above partly bounding the helicotrema and being fixed to the wall of the cupola, while that at the base fits into the angle at the commencement of the osseous spiral lamina in front of the floor of the vestibule. Near this lower end it receives a small epithelium-lined canal (*canalis reuniens*) from the saccule.

The function of the cochlea as a part of the auditory apparatus appears to depend largely upon certain structures which are found upon the floor of the ductus cochlearis. The edge of the osseous lamnia, or *limbus*, is a part of the floor, and is covered above by a loose form of connective tissue. As seen in section, the limbus terminates abruptly in a C-shaped border, the upper horn of which is termed the *labium tympanicum*, and the lower, the *labium vestibulare*, while the bay between them is called the *sulcus spiralis*. The connective tissue of the limbus is continuous with the basilar membrane, and just without the osseous lamina, in the labium vestibulare, are regularly arranged perforations for the transmission of some 4000 bundles of nerve fibers from the osseous lamina to the epithelium in the region of the *inner hair cells* of the *organ of Corti*.

The *membrane of Reissner* is a very delicate connective tissue membrane lined with simple pavement epithelium on its under surface, and with larger epithelial on its upper or vestibular side. A few blood capillaries ramify in its substance.

The *labium tympanicum* swells out to form the *tectorial membrane*, and then narrows to a thin extremity over the organ of Corti, being tipped with a *delicate reticular film* which overlies the *outer hair cells*.

The *basilar membrane* is narrow below, and increases in width towards the apex of the cochlea in proportion as the bony lamina becomes narrower. The membrane proper is composed of radiating fibrous tissue, within a homogeneous ground-substance, from the apex of the osseous lamina to a *spiral ridge* on the outer wall of the tube of the cochlea. On its under side this is covered with connective tissue cells; while on the upper (toward the apex of the cochlea) side are columnar epithelial cells which, over the inner (toward the modiolus) portion, are elongated to form the *organ* of *Corti*. Small blood-vessels ramify mostly in the very inner part, and form a larger longitudinally running vessel opposite the *outer rods of Corti* and known as the *vas spirale*.

The ORGAN OF CORTI is composed of the elongated epithelial cells on the inner half of the upper surface of the basilar membrane. The central part of this apparatus is formed of two sets of stiff rod-like bodies—the *inner and outer rods of Corti*—which stand upon the basilar membrane, with their bases some little distance apart and inclined towards each other, so that they are in contact above.

This arrangement encloses a space which, continued laterally, becomes a tunnel, the *tunnel of Corti*, along the whole extent of the cochlea canal. On the inner side of the inner series of rods is a row of epithelial cells which are surmounted by a brush of fine, short, stiff hairlets, and external to the outer rods are three or four successive rows of similar but more elongated cells. These have received the names, respectively, of the *inner* and *outer hair-cells*. The hairlets of the outer hair-cells project through apertures in the delicate *reticular film* at the apex of the *tectorial membrane* which covers this part of the organ of Corti like a wire net.

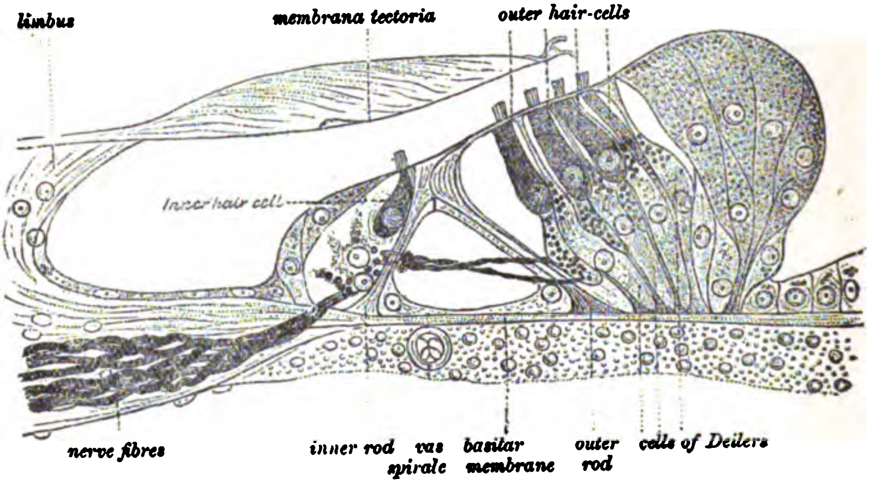

Fig. 67. Section through the Organ of Corti of the middle turn of the human cochlea. Highly magnified. (G. Retzius.)

The RODS OF CORTI are distinctly striated throughout their length and have at their heads an oval spot free from longitudinal markings called a pseudo-nucleus.

The *inner rods* are more numerous and shorter than the outer, and appear to be in contact throughout their length, while the outer ones, by reason of being narrowed (this is common to both) through the middle portion, stand distinct in that part, although their heads and feet are in contact. From the head of the outer rods a peculiar ring-like substance projects outward, being the first of a series of rings for the support and transmission of the hairlets of the inner hair cells.

The INNER HAIR CELLS are about 3,500 in number and are closely applied against the neighboring rods. These cells are larger than the rods, and when seen from above present an oval shape, with the hairlets growing from a curved line along their upper surface. They are short, rather columnar in shape and prolonged in a process below to their attachment to the upper surface of the basilar membrane. Between them, and wider below where the hair cells are narrow, are protoplasmic cells with large round nuclei. Fine nerve fibres appear to run in a spiral direction around these cells. About the tops of the inner hair cells are the reticular rings extending out from the rods.

The OUTER HAIR CELLS are cylindrical at the upper end where they fit into the rings of the reticular film through which the hairlets project, but lower down they are flattened to appear narrow when in profile, but broader when seen on the flat. The lower end is a rounded extremity with a nucleus. There are some 20 hairlets on the top of each cell.

DEITERS' CELLS are cylindrico-conical in shape and widest below the rounded extremity of the outer hair cells. Their attachment to the basilar membrane is by a broad base, through which they receive a cuticular filament which is prolonged to the tapering apex of the cell, between the hair cells and in close contact with one of them, where it appears to expand into one of the phalanges of the reticular film. There are some 12,000 outer hair cells.

The RETICULAR FILM or LAMINA which overlies the hair cell region of the organ of Corti, although they look like rings are really thin plates with thickened margins. These rounded film like structures termed phalanges, are united with each other and with the phalanges of the cells of Deiters. The hair-bearing ends of the auditory cells are isolated by them, and the hairlets project through the thin portion of the centre of the plates.

NERVES OF THE COCHLEA.

The branch of the auditory nerve which goes to the cochlea is given off in common with those to the saccule and the posterior ampulla. Itis flatter, shorter and broader than any of the other branches. It enters the bone through groups of minute foramina at the bottom of the internal meatus, below the opening of the Fallopian aqueduct. These groups are arranged in a shallow spiral furrow in the centre of the base of the cochlea ; and they lead into small bony canals, which first follow the direction of the axis of the cochlea, through the modiolus, and then radiate outwards, between the plates of the bony spiral lamina. In the centre of the spiral tract is a larger foramen which leads to the central canal of the modiolus. Through this canal and foramen the filaments for the last half turn of the spiral lamina are conducted ; whilst the first two turns are supplied by the filaments which occupy the smaller foramina and bent canals. Near the root of the spiral lamina the nerve fibers pass outwards through a spirally wound ganglionic cord (*ganglion spirale*), situated in the special bony canal already mentioned. Beyond this ganglion, the fibers, having resumed their medullary sheath, pass onwards with a plexiform arrangement, at first in distinct but anastomosing cords contained in separate canals, but afterwards spreading out into a thin layer of fibers, to be again brought together near the osseous lamina into conical bundles which turn abruptly upwards, and passing through the final aperture, lose their medullary sheath, and enter the epithelium in the region of the inner hair cells. Some of the nerve fibers appear to end here by ramifying with a spiral course amongst the bases of the inner hair-cells, but others are continued as fine threads between the inner rods and form a second spiral band close to the outer side of these and in contact with the protoplasmic cell which ensheaths them. Other fibers may be seen in sections to pass across the tunnel of Corti between the rods and to enter the region of the outer hair-cells. Here the fibers, which now again branch and alter their direction, run spirally, parallel with the successive series of hair-cells. They rest against the corresponding cells of Deiters, and in man form a bunch of spirally-running fibres immediately below the expanded part of each hair-cell. They form, therefore, altogether five or six spiral strands of fibrils, which lie between the epithelium-cells of the organ of Corti.

VESSELS OF THE COCHLEA.

There are some twelve or fourteen small vessels, branches of the internal auditory artery, which traverse small canals in the internal auditory meatus and the modiolus to radiate out through the spiral bony lamina. They are distributed to both surfaces of the lamina and the periosteum of the adjacent scalæ, but do not anastomose across the basilar membrane. A small twig is received in the bony cochlea from the stylo-mastoid branch of the occipital artery.

The veins, in the reverse of the arterial system, are gathered together from the tubes, spiral lamina and the modiolus to join at its base with those from the vestibule and semi-circular canals. A small vein passes through the aqueductus cochleæ to join the internal jugular.

DISEASES OF THE INTERNAL EAR.

As serious primary affections, diseases of the labyrinth are rare, while as sequels to tympanic diseases they occur with more frequency.

Hyperæmia of the Labyrinth is a condition which would not be diagnosed by itself, but would doubtless exist in some intra-cranial diseases and middle ear inflammations.

It might occur from a disturbance of circulation in the neck, as from pressure on the large veins, or from such medicines as the salicylates, quinine or amyl-nitrite, etc.

Anæmia of the Labyrinth may follow exhausting diseases, hæmorrhages, or defects of circulation. Tinnitus and vertigo would be the principal symptoms, while hearing would not be necessarily impaired. The ear conditions would be considered as accompaniments of the main disease and treated together with that.

INFLAMMATION OF THE LABYRINTH. (OTITIS INTERNA.)

Primary inflammation of the internal ear is very rare, but as a result of extension from some of the surrounding structures, the tympanum, the mastoid, and the cerebral cavity it is of occasional frequency.

Primary labyrinthitis has been reported, as following exposure to severe cold and as occurring without apparent cause, in which there was sudden deafness, more or less marked; and vertigo with tinnitus, but without any signs of middle-ear disease.

Voltolini first called attention to a form of primary *acute* labyrinthitis occurring in children. He says that the symptoms are such that the disease is often mistaken for meningitis. Patients are apt to complain first of vertigo, noises in the ears, perhaps some slight disturbance of vision with photophobia, staggering gait, and, finally, vomiting. Within a few hours deafness is noticed, and this rapidly increases to the point where it is complete, or nearly so. Other symptoms of meningitis are absent and the patient soon recovers from all but the difficulty in equilibrium and deafness.

Attacks of this kind may recur so that the case takes on an apoplectiform appearance. During the course of epidemics of cerebro-spinal meningitis cases of this kind have been reported in which the symptoms of fever and cerebral disturbance were very slight or wanting. Great difficulties must stand in the way of a clear diagnosis in such obscure cases.

To show how inflammation spreads from the meninges to the labyrinth WEBER-LIEL has shown by direct experimentation that a free communication exists between the endolymphatic and perilymphatic spaces of the labyrinth and the extralabyrinthine intracranial spaces.

If the deafness in labyrinthine disease is due to a serous effusion into the labyrinth, producing pressure on the terminal filaments of the auditory nerve the loss of hearing may be wholly or in part restored as the exudate is absorbed and cleared up.

For *secondary labyrinthitis* predisposing causes are the loss of the stirrup, caries and necrosis of the inner wall of the tympanum, the eruptive fevers such as *smallpox*, *mumps*, *diphtheria*, *typhoid*, and *cerebral meningitis*, by means of which the entrance of bacteria into the labyrinth becomes possible.

Purulent inflammation of the labyrinth endangers life as well as hearing, but the symptoms, except in severity and longer duration, do not differ materially from those already given.

The **prognosis** is unfavorable; some improvement may come, but a cure is not to be expected. The nausea and vomiting as well as the seizures may pass off in from a few hours to a few days, but the tinnitus and deafness, more or less modified, are apt to be permanent.

Treatment.—Rest and perfect quiet in bed is important. The bowels should be relaxed, and with the dominant school it is customary to use ice-bags to the mastoid, or counter-irritation. The Iodides of potash and soda, and pilocarpine are their drugs.

Chenopodium anthelminticum.—Deafness to the human voice, but acute perception of physical sounds.

Cinchona.—Vertigo, with loud or fine ringing in the ear. Probably helpful in physiological doses for these symptoms when resulting from anæmia, and in higher potency when caused by congestion.

Ferrum phosphoricum.—In the same general symptoms as in middle-ear diseases. In the early stages, symptoms like Aconite.

Gelsemium.—On its general symptoms when due to a serous exudate.

Hydrobromic acid.—In material doses for symptoms produced by congestion.

Sodium salicylate.—Like quinine, physiologically, for the symptoms due to anæmia.

DISEASES OF THE AUDITORY NERVE as mentioned in the various forms of labyrinthitis, hyperæmia, hypertrophy, atrophy, secondary inflammation and suppuration do not afford, in the present state of our knowledge of these pathological processes, very much in the way of a promising system of treatment. The secluded position of the parts, their minuteness, and the difficulty of examination, even in the cadaver, all have to do with this unfortunate condition of affairs.

NEUROSES OF THE PERCEPTIVE APPARATUS.

Double hearing in one ear and the *hearing of sound as a certain musical note in one ear and as a different one in the other* are symptoms which have been observed mainly in catarrhal disease of the middle ear, and have been ascribed to involvement of the cochlea. They disappear with the cure or improvement of the condition which caused them.

Hyperæsthesia Acoustica is an insufferable sensitiveness to sounds and noises. This condition is to be found only in persons of a highly nervous temperament, and is usually looked upon as a symptom of the nervous system generally, rather than as one of aural disturbance.

Paracusis Willisii is that condition in which a deaf person hears better in a place where there is a constant succession of loud sounds, and is considered as belonging essentially to sclerosis. It is doubtless due to the fact that when great sounds set the ossicles and mechanism in vibration the lesser vibrations are carried along with the greater to the perceptive organ.

SUBJECTIVE SOUNDS.

Tinnitus aurium is, to most of the unfortunate sufferers of aural diseases, a most distressing symptom, and for the relief of which they are most persistent seekers. It is well to recognize that there are a variety of causes for this trouble; some three or four at least, between which it is frequently not so easy to differentiate.

There is a form of sound within the ear which is quite rare, and perhaps generally escapes detection in this one point—that it *can also be heard by the examiner* if he tries to do so. It does not, then, really belong in this list; but it is best, perhaps, to describe it here. This sound is of a crackling, intermittent character, and is dependent upon an abnormal action of muscles of the tympanum, the tensor tympani, stapedius, or those of the Eustachian tube. Some observers claim to have seen motions of the membrana tympani coincident with these sounds. If the physician will put his ear to that of the patient, or, better still, use the auscultating tube, he will also hear these sounds. In many cases where this maddening symptom comes on with subacute catarrh it disappears when that is also relieved.

In anæmia or aneurism there is a *venous murmur*, transmitted from the jugular vein which passes just beneath the floor of the tympanum, or from the internal carotid pulsating in the apex of the petrous bone. With this variety of tinnitus there need not be any impairment of hearing.

Another form of tinnitus is found which doubtless arises wholly within the tympanum, when, in the course of acute or subacute catarrh, the swollen, thickened, and congested mucous membrane over one area comes in contact, occasionally, with that over another part of its walls, bones, muscles, or ligaments. This sound may be synchronous with the pulsation of its minute vessels.

That form of tinnitus which is most frequent and is associated with sclerosis has long been a subject of study. Many theories as to its cause have been advanced.

The opinions held now do not, by any means, agree in many ways, but it seems to be accepted that whatever will disturb the *equilibrium* of *pressure in the labyrinth* will cause tinnitus. Anæmia and hyperæmia will disturb the pressure equilibrium in the endolymph and perilymph, and both of these are causes of tinnitis. In the same way may be explained that form of tinnitus resulting from large doses of quinine or salicylate of soda. Thus, also, can we account for the noises—singing—in the ears experienced in syncope, and following severe hæmorrhages.

In sclerosis there is, except in rare instances, both an impairment of hearing and a development of subjective sounds, both of which tend to become progressively worse. This is due partly to the continuous development of the new tissue, and partly to the secondary changes which take place. Among such changes are the shrinking which goes on in the new formation, occasioning retraction of the different structures; the rigidity produced in the articulations; and the abnormal position of the ossicles, which may, and usually does, follow. Not only is the function of the conducting apparatus thereby impaired, but secondary labyrinthine changes likewise occur. The lumen of the Eustachian tube is narrowed or obliterated; the drum-membrane is dry and sinks in, the ossicles are displaced and rigid, the promontory comes in contact with the drum-membrane, new adhesions, with bands and secondary membranes, develop, and the foot-plate of the stirrup is pushed into the oval window.

With the incursion of the foot-plate the fenestra ovalis is pressed into the vestibule, thereby disturbing the pressure equilibrium in the labyrinth.

Subjective sounds are often very real to the s
exist, for the most part, only in his own consciousnes
frequently they will think it very peculiar that the e
not hear them by putting his ear up to theirs. They
to other natural sounds, such as the escape of steam,
of water, clear flute like notes, chirping of birds
Even in those totally deaf the sounds may be ever
are most distracting. It is doubtless true that some
been made insane through this constant din. In
there may be some doubt as to which is cause and w
but if all insane persons could have ear treatment for t
tive noises not a little good would certainly result
noise in the ears is an excitant to the diseased mi
motes hallucinations.

Inclement, stormy and damp weather, together
temperature, tends to increase tinnitus. So, also, d
of quinine, salicylate of sodium and the excessive us
and tobacco. Warm and dry weather, good health
and an interesting diversion of the mind are favor
improvement. When in conversation, listening to a
or in the presence of a louder noise, such as on a st
sounds disappear, or are not noticed. Many peopl
whether the sounds are gone or simply masked on
sions. When in quiet surroundings, the noises ar
Very fortunately many persons develop a tolerance
fortunate condition.

The **prognosis** depends on the cause. In scl
rinthitis, and certain wasting fatal diseases it is c
good. The longer they have existed as constant and
varying sounds the less hopeful they are of improve

Treatment.—This, too, depends upon the caus
and is regulated by it. As a rule, it may be stated
deafness and tinnitus exist together the former is mor
to improvement, but it will not do to promise too
treatment of either trouble. Our old school friends
of sodium for the relief of the noises left over fro

subsided middle-ear inflammation. Quinine is suggested, but, since we know that it congests the middle ear, it would seem that it could do no good unless it be in the anæmic conditions of wasting diseases.

Of late our school has brought forward a form of massage to the ear by means of some very ingenious mechanism, and these ideas have been appropriated more or less by our friends.

We have had the "*otophone*" the *phonograph*, the "*vibrometer*," and, lately, Dr. Houghton has improved upon the *otophone*. Dr. Stephenson has brought out his "*phono pneumo-massage*" machine, and Dr. Kellogg reports a very ingenious method of alternating the pneumatic massage through first the external canal, and then the Eustachian tube.

It is natural to ask *upon what theory these machines are used?* What are they supposed to accomplish? In this connection it should be stated that the auditory nerve becomes more or less atrophied from non-use. If this is so, then why should it not be that those ultimate auditory nerve-endings in the cochlea, being the least used, on account of the failure of the tympanic apparatus to transmit certain sounds, should be most in a state of inability to perceive sounds? If this is accepted, it follows that these ultimate nerve-endings will be benefited by exercise. Now, if it were possible to know what portion of the nerve-endings were defective, and to what tone they responded, and then to supply that tone through a phono-massage machine, there would doubtless result some improvement. In this way we can see some possibility of the "musical-tone"—part of aural massage being of benefit.

In regard to aural massage generally, and quoting Dr. Houghton, it may be said that audition is the function of reception, conduction, and perception of sound-force, and that the perfection of this function depends on the integrity of the external ear for reception, the middle ear for conduction, and internal ear for perception. Pathology shows that it is the function of the middle ear that is specially increased by massage. We know that there exists in the ear all of those conditions for the relief of which massage is generally given.

Massage, in general, gives mobility to rigid articulations, freedom to capsular or intercapsular ligaments, restores wasted muscles, increases the circulation and destructive met phosis, aids nutrition, and lastly, but most vital, it ene the nerve at the centre and terminal. These .results are be desired for the diseased ear.

One of Dr. Houghton's earlier massage machines was r a dry cell storage battery, and with it he applied, at one tin through a stethoscope, faradic energy, for the purpose of s lating the nerves having to do with the nutrition of the pa fault; vibrations, being a method of succussion to the mech of middle ear; and musical tones, for their effect, I su upon the auditory nerve endings.

Another and later machine, the oscillatory, is a motor connection with the incandescent light system. With thi under a controller, suction, or pressure, separately or in al tion, can be applied through the external canal. The oscill may be made to vary from 30 to 1000 per minute and the of pressure, or suction can be carefully regulated.

By the use of some very ingenious attachments this m may be made to run a drill or a cautery, an atomizer of and an insufflator of powders. It can heat and project hot vapors. By a nasal tip, massage can be applied to the nasal and pharyngeal surfaces. Upon the defects of the m ism of the middle ear it would seem that massage, in th of passive motion, must have some good effects. It is di however, to understand how *sound*, as a noise, can aid m Sound, as a musical tone, is, perhaps, useful as a f massage to the organs of the internal ear.

The method of massage by inflation of the middle done by Dr. Kellogg, through the fittings to an Eust catheter, would have some advantages over methods di entirely through the external canal. It would not cause the handle of the malleus to make an excursion o with the membrane, as in suction through the external but would press upon all the walls of the tympanum, and greater effect upon imperfections of the chain of bone it would also strongly modify the circulation of the part

Dr Stevenson's machine is an electric motor to apply and pneumatic massage to the middle ear through the e canal. The rapidity and quality of sound, air-pressure, and suction are under easy control.

One of the earlier massage instruments was that of Delstanche.

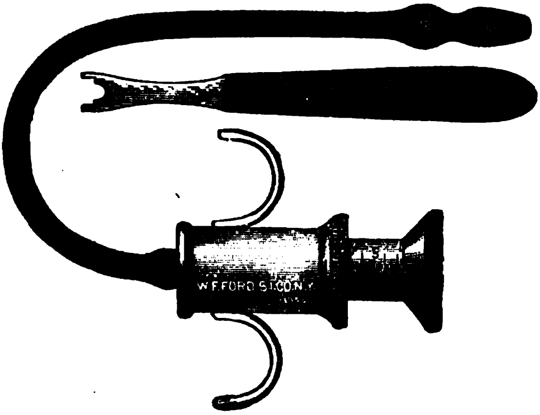

Fig. 68. Delstanche's Rarificator.

Concussion of the Labyrinth may result as an effect of external violence—as from a blow, shock or explosion—and without any perceptible lesion in the ear.

If there be damage to other aural structures it is, of course, more easy to diagnose and understand the symptoms presented. As in concussion of the brain, so also in the labyrinth, no pathological changes have been recognizable in post-mortem examination.

These derangements most frequently follow from the discharge of heavy firearms and may be unilateral or bilateral, but are generally in the ear turned towards the explosion.

The **subjective symptoms** are by no means uniform. The patient may be giddy and fall down or may become unconscious. Pain may result and last for several hours. Subjective sounds of various degrees may be experienced and modified during the course of the affection. Hearing may be enfeebled, modified or lost. There may be hyperæsthesia acoustica and the pitch of certain tones may be altered to seem too high, or too low, or there may be only a jangle of sounds.

The **symptoms** come on quickly, and, in many cases, are not long-lasting. In case there is actual injury to the structures of the labyrinth, they are not apt to come on so rapidly, but will increase and be persistent and have much of the appearance of Menièré's disease.

Concussion of the labyrinth is to be compared with commotio retinæ.

It is impossible to give a **prognosis** in these cases, for the noise, deafness and vertigo have been known to last for as long as two years, and then pass away.

In the way of **treatment** it must be said that the air-douche and electricity should not be used. If the patient is plethoric, local bleeding may be of service. Rest and quiet should be enjoined, and local cold applications and general hydropathic treatment should be considered.

DEAFNESS FROM CEREBRAL CAUSES is usually to be traced to meningitis, or, occasionally, to a brain tumor. Deafness generally results during the first few weeks of the disease, and is absolute. In some cases there may be tinnitus or staggering gait, at least at first, but these symptoms are not usually present. **Treatment** is generally useless.

WORD DEAFNESS is a peculiar condition in which the sounds are heard, but there is an incapacity to appreciate the compound sound as words This is seen in disease of the brain involving the first convolution of the temporal lobe.

When *cerebral tumors are a cause of deafness* the symptoms are very much like those of labyrinthine disease, including vertigo, tinnitus, more or less deafness and gastric disturbance.

The **diagnosis** would depend upon the other symptoms produced. Bone conduction would be apt to be good. There might be optic neuritis or paralysis of certain nerves.

INJURIES TO THE LABYRINTH result from the same causes as do concussion to that structure, and have the same symptoms, together with a flow of blood and serous fluid. The labyrinth may receive a penetrating wound through the tympanum, or suffer in a fracture of the base of the skull. **Diagnosis, prognosis,** and **treatment** will not differ from that of concussion, except in such ways as the conditions of the canal, drum-membrane, and tympanum may demand.

DEAF-MUTISM.

This consists in the lack, or loss, of speech as the result of deafness, usually congenital, or acquired in early childhood. It is certainly a rare disease, for very few are brought to the hospitals and dispensaries for examination. The proportion of deaf-mutes in the United States is estimated at four in every ten thousand of the population.

When a child of six years or under becomes totally deaf, it usually loses the faculty of speech. When this does not happen it is because the child has good mental development and is encouraged to talk. When children have learned to read and write they seldom lose the faculty of speech.

There may be some slight ability to hear in persons usually classed as deaf-mutes. Some may be just able to hear the report of a cannon; others may hear the ringing of a bell, and some, the loudest of human sounds. Such persons would not have hearing enough to prevent them from losing the faculty of speech, but those of this class who can hear the most are more easily taught to speak.

Those diseases which destroy the hearing in childhood most frequently are scarlet fever, diphtheria, other exanthemata, intracranial inflammations, labyrinthitis, typhoid fever and mumps. Deaf-mutism is favored by heredity and the consanguinity of the parents.

The cause of congenital deaf-mutism is not positively known. It may be that there is a deformity or lack of development in some part of the internal ear.

Congenital deaf-mutism is frequently not discovered till the time arrives when a child ought to begin to speak. Parents frequently think they are backward, or have some defect of the organs of speech, when in fact they are deaf. Backward children should be tested by using loud sounds, out of their sight, and in such a manner that they shall not appreciate any vibrations of air nor jar of the floor.

The **diagnosis** of these cases is not difficult and is indicated by the above description.

The **treatment** in the acquired form is to be applied to the cause, and before it has accomplished deafness, if the patient is seen at that period. If only seen later, then the treatment is such as is proper for such conditions in the middle and external ear as have been left over from the acute stage of the trouble. The treatment of deaf-mutism is mainly educational.

The instruction of them should begin as soon as the hopeless condition of their hearing is an established fact.

Lip-reading and articulate speech are the conditions to be desired, and should always be taught them. The sign-language is very useful, but not so helpful as the former.

The method of teaching deaf-mutes has become a specialty, and the result is frequently startling as well as gratifying. They can be taught to lip-read and read by the sign-language enough to acquire a useful education, and become proficient in the trades and arts. In nearly all states and large cities there are public and private schools for the deaf and dumb, and they achieve results which are most satisfactory.

INSTRUMENTS TO AID THE HEARING.

No better methods of aid to the partially deaf have been discovered than those which receive, condense, and conduct sound-waves to the external canal. Hard-rubber fans and such devices to hold between the teeth are of but little use. Some like them, because they fancy them less conspicuous. Of all the ingenious mechanisms to lodge within the external canal, none are of real merit as aids to hearing, and in most cases they irritate and inflame the canal and membrane. I have known them to re-

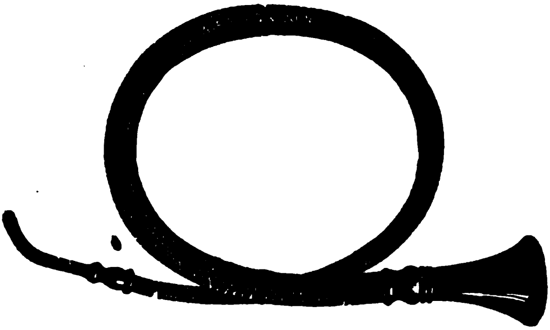

Fig. 69. Conversation tube.

kindle a purulent inflammation which had been quiescent for years. I have had many patients who had tried and discarded them.

It is stated that, after extensive destruction of the drumhead and when all inflammation has passed, a small pledget of cotton placed against the malleus will improve the hearing, but I have tried it in many cases and have not, as yet, found it helpful.

Among other devices for aiding the deaf the CONVERSATION TUBE holds its own place well, in spite of innumerable new instruments. This consists of an elastic, spiral-wire tube, covered with rubber and woven silk, having at one end a hard-rubber ear-piece and at the other a funnel-shaped ending for the use of the speaker.

Another popular style, known as the LONDON HORN is intended for use at lectures, etc., and is held in the patient's hand to the ear, and consists of a short, curved ear-piece and a large receiver, or drum. These ear trumpets are very material aids to those who are deaf from middle-ear diseases, but those who suffer from an affection of the auditory nerve are without hope.

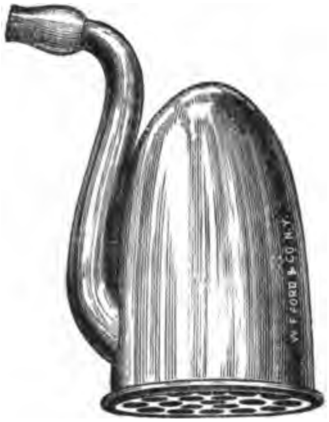
W F FORD & CO N.Y.

Fig. 70. London Hearing-horn.

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